GEORGETOWN STEAM PLANT

Low-Lying Area Interim Action Work Plan

Prepared for
Seattle City Light
P.O. Box 34023
Seattle, WA 98124-4023

Prepared by
integral consulting inc.
411 1st Avenue S.
Suite 550
Seattle, WA 98104

August 20, 2010

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ACRONYMS AND ABBREVIATIONS

Agreed Order	North Boeing Field/Georgetown Steam Plant Agreed Order No. DE 5685
amsl	above mean sea level
ARAR	applicable or relevant and appropriate requirement
BaP TEQ	benzo(a)pyrene toxicity equivalence
bgs	below ground surface
Boeing	The Boeing Company
City	City of Seattle
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CPT	cone penetrometer test
CSL	cleanup screening level
DOT	U.S. Department of Transportation
DRO+MO	diesel and motor oil-range organics
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
gpm	gallons per minute
GRO	gasoline-range organics
GTSP	Georgetown Steam Plant
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations
IAWP	interim action work plan
Integral	Integral Consulting Inc.
KCIA	King County International Airport
LLA	Low-Lying Area
MCL	maximum contaminant level
MTCA	Model Toxics Control Act
NBF	North Boeing Field
PAH	polycyclic aromatic hydrocarbon

PCB	polychlorinated biphenyl
PQL	practical quantitation limit
SAP	sampling and analysis plan
SCL	Seattle City Light
SOW	statement of work
SVOC	semivolatile organic compound
TEE	terrestrial ecological evaluation
TEQ	toxicity equivalent
TPH	total petroleum hydrocarbons
TPH-G	total petroleum hydrocarbons-gasoline range
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon
WQC	water quality criteria
WSDOT	Washington State Department of Transportation

1 INTRODUCTION

The Georgetown Steam Plant (GTSP) is a portion of the area addressed by the North Boeing Field/Georgetown Steam Plant Agreed Order No. DE 5685 issued under the Washington State Model Toxics Control Act (MTCA) (RCW 70.105D.050(1)) on July 3, 2008 (the Agreed Order). Potentially liable parties under this order include the City of Seattle (the City), King County, and the Boeing Company (Boeing). The GTSP is owned by the City, and Seattle City Light (SCL) will perform the work at the GTSP.

On June 18, 2010, the Washington State Department of Ecology (Ecology) issued a letter requiring the City "to submit a revised schedule and plans for beginning soil removal activities in the vicinity of the southwest fenceline of the GTSP property during the 2010 construction season." This interim action work plan (IAWP) has been developed in response. As defined by Ecology's letter, the purpose of the interim action is to remove additional sources of polychlorinated biphenyls (PCBs) at the GTSP property that have the potential to migrate offsite, enter Boeing's storm drain system, and recontaminate Slip 4 sediments following its remediation in 2011/2012. This interim action will precede the full remedial investigation and feasibility study process planned for the overall site which includes the GTSP property and North Boeing Field (NBF).

SCL intends to complete this interim action in general accordance with applicable requirements of MTCA and the federal Toxic Substances Control Act (TSCA). TSCA requires that the work plan be reviewed by U.S. Environmental Protection Agency (EPA) Region 10 under the self-implementing procedures for remediation waste (40 CFR 761.61 (a)). SCL also intends to remediate immediately contiguous areas in the same region of the site that are contaminated with other chemicals (i.e., arsenic, total petroleum hydrocarbons [TPH], and carcinogenic polycyclic aromatic hydrocarbons [cPAHs]).

This interim action is on a fast-track schedule in order to complete the work during the dry season. Design parameters in this IAWP are conceptual in nature and are subject to modification. Successful implementation of the interim action relies in part on the contractor's understanding of the project gained through meetings with SCL and Integral Consulting Inc. (Integral), site visits, and other background information provided during project planning.

The remainder of this work plan provides brief background information, objectives of the proposed interim action, a summary of how cleanup levels were established, technical parameters for the preliminary design, and a preliminary scope of work. Figures and preliminary design sketches are also included; however, final design documents will be produced with the final scope of work (SOW) to be provided to the contractor.

1.1 BACKGROUND

Built in 1906, the Georgetown Steam Plant is a National Historic Landmark that previously produced electricity for the local area. The site is located at 6605 13th Avenue South, at the intersection of Greely Street at the north end of King County International Airport (KCIA) (Figure 1-1). PCB-contaminated soil has been detected in the southwest portion of the GTSP property and along the southern boundary, adjacent to Boeing-leased property. This area is referred to as the low-lying area (LLA) because surface water historically flowed to this region from portions of the GTSP, KCIA, and Boeing-leased property. Two earlier removal actions addressed PCBs in this area. In 1985, a remedial action addressed soils in part of the LLA and in 2006 an interim remedial action addressed soils along the southwest fence line (see Figure 3-2 in Integral 2010b). Confirmation sampling at the base of the 2006 interim action excavation identified soils contaminated PCBs at concentrations up to 2,900 mg/kg (Integral 2006b). Groundwater monitoring conducted in 2006/2007 at five locations on GTSP property identified PCBs only in groundwater underlying the LLA.

A site characterization work plan (Integral 2010a) was prepared for the GTSP property including the LLA. Following receipt of Ecology's June 16, 2010, letter, SCL moved forward with the field program and expedited data generation for the LLA. A preliminary data report for LLA, based on unvalidated data, has been prepared under separate cover, and the unvalidated data are evaluated in Section 2 of this work plan. A data report for the entire site, based on validated data, will be prepared later in 2010.

Although PCB soil concentrations within the proposed excavation area vary considerably, it is expected that only a small fraction of the excavated soils will have concentrations equal to or greater than 50 mg/kg. Only this portion of contaminated soil will be disposed of at a landfill approved under TSCA.

1.2 SITE DESCRIPTION

The Steam Plant occupies a 2.8 acre parcel at the northern end of NBF in south Seattle (Figure 1-1). King County owns the adjacent property, much of which is leased to Boeing. Surrounding land uses include Boeing's Propulsion and Engineering Lab, the Washington Air National Guard, Washington State Department of Transportation facilities, and a King County truck maintenance facility.

The Steam Plant is on the National Register of Historic Places (No. S264) and currently operates as a museum. Visitors to the museum have access to the outdoor portions of the site. A scale model railroad operates on a portion of the yard to the southeast of the building.

The majority of the site excluding the power house is covered by a grass lawn. Primary site features are the power house located in the northern portion of the property, a circular concrete water reservoir located near the northwestern corner of the power house, a scale model railroad circuit located southeast of the power house, two small sheds located to the east of the railroad, and a drainage swale that extends along the southern property fence line (Bridgewater 2000). There is also a concrete slab on the north side of the power house where the former Greeley Substation was located.

Based on a site survey completed in 2006 the GTSP property generally slopes to the south and southwest. The topography in the upper (northern) approximately two-thirds of the property slopes gently to the south, and then drops more steeply to the LLA that runs along the south property boundary. The LLA forms a broad swale that receives runoff from the northern portion of the site and historically from KCIA and Boeing-leased property. The swale slopes to the west, toward the southwest corner of the GTSP property boundary. There is a slight depression in the southwest corner in an area where ponding was observed historically (Integral 2010b).

1.3 OBJECTIVES

The primary objective of this interim action is to remove sources of PCBs from the LLA with the potential to migrate offsite and to contaminate Slip 4. The secondary objective of this interim action is to remove soils within the LLA that are contaminated with other chemicals at levels exceeding interim action removal levels so that further remediation in this part of the GTSP site is not needed in the future. The selected interim action is excavation and offsite disposal of contaminated soils from the LLA. A third objective of this interim action is to implement measures that will reduce the risk of recontamination of clean soils imported to backfill the excavation. Such measures will address possible onsite migration of contaminants into remediated areas.

2 REMOVAL AREA BOUNDARY

This section of the IAWP provides a description of the development of the removal area to be addressed in this interim action. The remainder of this section is organized as follows:

- A summary of the data available to define the removal area boundary
- A discussion of applicable screening levels to be used to define the removal area boundary
- A screening of the available data
- Recommendations for LLA interim action removal levels
- A presentation of the removal area boundary.

2.1 DATA SUMMARY

SCL has conducted numerous investigations on the GTSP property to identify sources and areas of contamination. Previous investigations have been summarized, and the historical data are mapped and compared to screening levels in Section 5 of the draft site characterization work plan (Integral 2010a). Further, field activities within the LLA to address data gaps identified in the work plan were conducted between July 12 and 29, 2010. The investigation consisted of both soil and groundwater sampling within the LLA. The results of this field investigation are provided in the Georgetown Steam Plant Low-Lying Area Data Report (LLA Data Report; Integral 2010b). The following sections provide a brief discussion of data collected within the LLA.

2.1.1 Historical Investigations in the LLA

A number of investigations have been conducted within the LLA.

SAIC (2009). This data summary report presents historical data at the GTSP. Notable information from the 1980s includes:

- 1982: In response to source tracing work conducted by the Municipality of Metropolitan Seattle, SCL began investigation of PCBs at the GTSP and associated flume.
- 1983: SCL removed trash from an area just north of the LLA and filled the boiler blowdown ditch.
- 1984: SCL collected soil samples at the GTSP to evaluate the presence of PCBs. Based on the resulting data, SCL covered the drainage ditch from KCIA and the low-lying area

with plastic. In addition, King County diverted surface water runoff from the KCIA to minimize flow into the ditch and LLA.

- 1985: Soils in the LLA were removed to a depth of 3 to 4 ft from an area measuring about 40 by 50 ft. The goal of this removal action was to remove soils containing PCBs at concentrations greater than 10 mg/kg. Confirmation sampling following soil removal indicated PCB concentrations were reduced to 11 mg/kg or less.

Bridgewater (2001). Bridgewater conducted a comprehensive Phase II sampling program to characterize potential contaminant sources in the power house and in GTSP soils. Results of soil sampling from outside of the power house are summarized below. The MTCA Method A values mentioned below are the values referenced in the Bridgewater (2001) report, which have been superseded by the 2001 revisions to MTCA.

- Low-Lying Area. Three soil samples were analyzed for PCBs with concentrations ranging between 0.25 and 8.27 mg/kg. Gasoline- and diesel-range TPH were detected in one of the samples, which also exceeded the MTCA Method A screening level. The petroleum in this sample was identified as kerosene. No cPAHs were detected at a detection limit of 0.017 mg/kg.
- Scale Model Railroad. Nine soil samples were collected where the scale model railroad was located and analyzed for PCBs. No PCBs were detected in four of the nine samples with detection limits between 0.035 to 0.082 mg/kg. Total PCBs in the remaining five samples ranged from 0.18 to 4.3 mg/kg and were below the MTCA Method A industrial land use soil value of 10 mg/kg.

Integral (2006a). Integral conducted a soil sampling program along the southwest fence line in the region where Boeing (Bach 2005, pers. comm.) reported PCBs greater than 1 ppm in soil that had been transported between concrete blocks onto Boeing-leased property. Integral confirmed the elevated PCBs on Boeing-leased property and also sampled surface and subsurface soils immediately behind the concrete blocks (i.e., on the GTSP side of the concrete blocks). Elevated PCBs were identified and SCL designed and performed an interim removal action (see Integral 2006b).

Integral (2006b). This interim action completion report documents the interim action conducted by SCL along the southwest fence line. The goal of the interim action was to prevent soils containing PCBs from moving through cracks between the concrete blocks to property leased by Boeing. Soils were removed from the GTSP side of the concrete blocks to a depth that was below the bottom of the blocks. A geotextile fabric was placed over the excavation area and the trench was backfilled and reseeded. Cracks between the concrete blocks were filled with grout. Confirmation sampling determined that soils containing PCBs up to 3,800 ppm remain beneath the excavation.

D.M.D. (2006). One soil sample and a duplicate were collected from the LLA and analyzed for TPH, semivolatile organic compounds (SVOCs), PCBs, dioxins, and metals. PCBs were observed at 28 and 34 mg/kg and dioxins were reported at 9.77 and 10 ng/kg toxicity equivalent (TEQ). TPH analyses identified diesel-range TPH below the MTCA Method A screening level; based on chromatogram review, the material was identified as kerosene.

Integral (2007). Integral installed five groundwater monitoring wells and conducted quarterly monitoring for four quarters. Two wells had no exceedances of MTCA screening levels. Trichloroethene exceeded the MTCA screening level in two wells and PCBs exceeded MTCA screening levels in the well located in the low-lying area.

Landau (2008). Landau Associates conducted a sampling program in 2008 to generate PCB data for soil, marine sediment, catch basin and flume solids, ash and debris at the GTSP, Willow and Ellis Street Substations, NBF, and Slip 4. At the GTSP, a total of 53 soil borings were advanced resulting in a total of 61 soil samples and 3 duplicate samples. Sample depths ranged from 3 to 9 ft below ground surface (bgs) with sample depths dependent on soil appearance. Thirty-one borings were taken in the south yard and 36 samples were analyzed. Three samples had PCB concentration of 1 ppm or greater, four samples had detected concentrations less than 1 ppm, and PCBs were not detected in the remaining samples. Samples with PCBs at or above 1 ppm were located in or near the low-lying area.

2.1.2 July 2010 Investigation in the LLA

The LLA Data Report (Integral 2010b) presents a detailed discussion of the July 2010 investigation activities and results in the LLA. (A data report containing data generated in 2010 from other areas on GTSP property will be prepared later in 2010.) The following subsections present a brief summary of the July 2010 data used in the development of the removal area boundary.

2.1.2.1 Investigation Design

A total of 16 direct push borings were advanced within the LLA to define the horizontal and vertical extent of PCBs and TPH in subsurface soils. Groundwater was also sampled from temporary monitoring wells installed in four these borings to assess potential PCB impacts to groundwater. Cone penetrometer tests (CPTs) for geotechnical analyses were conducted at two locations. Listed below are the number of borings advanced and types of samples collected during the LLA site characterization:

- Soil and CPTs: 2 locations
- Soil samples only: 10 locations
- Soil and groundwater; converted to temporary monitoring wells: 4 locations.

2.1.2.2 Soil Data

The following discussion of soil sampling results focuses on the percent of samples with detected concentrations, the range of concentrations detected, the range of detection limits, and the locations within the LLA where the highest concentrations were detected for each analyte. Soil data screening is presented in Section 2.3.

PCBs

PCBs were analyzed in 135 samples at 16 soil boring locations located throughout the LLA, with depths ranging from surface (0–0.5 ft bgs) to 18.5 ft bgs. PCBs were detected in 69 samples, or 51 percent of those analyzed. Detected total PCB concentrations ranged from 0.032 to 530 mg/kg with detection limits ranging from 0.030 to 0.048 mg/kg. Twenty-seven samples had concentrations greater than 1 mg/kg, 8 samples had concentrations greater than 10 mg/kg, and one sample had a concentration greater than 100 mg/kg (530 mg/kg in LLASB01 at 2 ft bgs). PCB results are summarized in Figure 4-6 of the LLA Data Report. Detected concentrations greater than 10 mg/kg are restricted to the southwest corner of the LLA and depths shallower than 6.5 ft. Detections greater than 1 mg/kg were found at two locations in the southeast end of the LLA at depths less than 3.5 ft.

Petroleum

TPH was analyzed in 59 samples at 16 soil boring locations located throughout the LLA. Diesel and oil range organics were detected in 58 and 73 percent of the samples analyzed, respectively, and all samples had concentrations less than 2,000 mg/kg. The sum of diesel- and oil-range organics at SB05, 8 ft bgs, is 2,600 mg/kg. Gasoline range organics were detected in 22 percent of the samples, with 6 samples greater than 100 mg/kg and 16 samples greater than 30 mg/kg. TPH results are summarized in Figure 4-5 of the LLA Data Report. The highest detections of gasoline-range hydrocarbons are located in the southwest corner and along the southern fence line at depths between 3.5 and 8 ft.

Metals

Metals were analyzed in 31 soil samples at 9 locations located in the LLA: LLASB01, LLSB02, LLASB05, LLASB06, LLASB07, LLASB08, LLASB10, LLASB11, and LLASB12. Most samples analyzed for metals were at depths between 5 and 9.5 ft, with five samples collected at shallower depths. A summary of detection frequency and minimum and maximum detections is provided below.

Metal	Frequency of Detection	Minimum Detected (mg/kg)	Maximum Detected (mg/kg)
Arsenic	52%	7	17
Cadmium	87%	0.2	2.6
Chromium	100%	11.1	40.2
Copper	100%	8.5	136
Lead	84%	3	140
Mercury	68%	0.02	2.56
Nickel	100%	6	130
Tin	10%	2	6
Zinc	100%	23	310

Polycyclic Aromatic Hydrocarbons

PAHs were analyzed in 39 samples at 10 soil boring locations located in the LLA: LLATW01, LLATW04, LLASB01, LLASB02, LLASB05, LLASB07, LLASB08, LLASB10, LLASB11, and LLASB12. Carcinogenic PAHs were detected in 14 samples with detected concentrations ranging from 0.015 to 0.456 mg/kg. Two of the samples had cPAHs detections greater than 0.140 mg/kg. As shown in Figure 4-7 of the LLA Data Report, these two samples are located in the southwest corner of the LLA at LLATW01 (3.5–5 ft) and LASB05 (6.5–8 ft).

Phenols

Phenols were analyzed in 38 samples as described above for PAHs. Phenol was detected in five samples at LLATW04 with concentrations ranging up to 0.032 mg/kg.

Phthalates

Phthalates were analyzed in 38 samples as described above for PAHs. Bis(2-ethylhexyl)-phthalate was detected in 74 percent of the samples with detected concentrations ranging up to 1 mg/kg. Other phthalates were detected less frequently (up to 16 percent), at concentrations ranging up to 0.250 mg/kg.

Semivolatile Organic Compounds

SVOCs were analyzed in 36 samples as described above for PAHs. The SVOCs benzoic acid, carbazole, dibutyl phenylphosphate, isophorone, and tributyl phosphate were detected in one or two samples. Dibenzofuran was detected in 18 samples, at concentrations ranging up to 0.100 mg/kg.

Volatile Organic Compounds

Volatile organic compounds (VOCs) were analyzed in LLA soil boring locations LLATW02, LLASB01 (and field split), and LLASB02 each at 5 ft bgs. Acetone, carbon disulfide, toluene, *m,p*-xylenes, and 1,2,4-trimethylbenzene were detected at one to three locations each. No VOCs were detected at LLASB05, though detection limits for some analytes were higher than in the other samples analyzed for VOCs.

Pesticides

Pesticides were analyzed in LLA soil boring locations LLASB01 (and field split) and LLASB02, each at 5 ft bgs. No pesticides were detected in any samples, with detection limits ranging up to 20 mg/kg (α-endosulfan).

Dioxins and Furans

One sample (and field split) from the LLA has been submitted for dioxin and furans analysis: LLASB09, 0-0.5 ft depth. Results for this analysis are pending.

2.1.2.3 Groundwater Data

PCBs were analyzed in four groundwater samples collected from four temporary wells located in the southwest corner of the LLA. PCBs were detected in three samples. PCB Aroclors 1016 and 1248 were each detected in one sample, and Aroclor 1254 was detected in two samples. Detected total PCB concentrations range from 0.012 to 4.3 μg/L. The detection limit for each Aroclor was 0.010 μg/L. PCB results are summarized in Figure 4-7 of the LLA Data Report. The highest detected concentration was located along the west end of the south fence line (LLATW04).

2.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This interim action will protect human health and the environment by substantially reducing the potential for human and ecological exposure to soils above the interim action removal levels (established below). The interim action will comply with federal, state and local laws in accordance with WAC 173-340-710. While remedial actions conducted under an agreed order are exempt from the procedural requirements of certain laws, the substantive requirements of these laws must still be met.

WAC 173-340-710 defines applicable requirements as "cleanup standards, standards of control, and other environmental protection requirements, criteria, or limitations adopted under state or federal law that specifically address a hazardous substance, cleanup action, location or other circumstances at the site." Relevant and appropriate requirements are "cleanup standards, standards of control, and other environmental requirements, criteria, or limitations established under state or federal law that, while not legally applicable to the hazardous substance, cleanup action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at a site that their use is well suited to the particular site."

Applicable or relevant and appropriate requirements (ARARs) may be divided into the following categories: chemical-specific, action-specific, or location-specific. These different categories are defined in the sections below; potential ARARs for the interim action are list in Tables 3-1 (chemical-specific ARARs), 3-2 (action-specific ARARs), and 3-3 (location-specific ARARs).

2.2.1 Chemical-Specific ARARs

Chemical-specific requirements set concentration limits or ranges in various types of environmental media. Such ARARs may set protective cleanup levels for the chemical of concern in the designated media. Chemical-specific ARARs may also indicate an appropriate level of discharge (these types of ARARs may also be considered action-specific). Chemical-specific requirements are health- or risk-based concentration limits. They are based on current, publicly available information and do not reflect administrative discretion that may be exercised in the future by federal or state authorities.

2.2.2 Action-Specific ARARs

Action-specific ARARs are typically technology- or activity-based requirements or limitations on actions. These requirements are not triggered by the specific contaminants identified, but by activities related to management of these contaminants. Requirements such as standards under the Occupational Safety and Health Act of 1970 are excluded as action-specific ARARs because they must be adhered to under all circumstances, regardless of whether the activity conducted is related to a MTCA action.

2.2.3 Location-Specific ARARs

Location-specific ARARs are restrictions placed on either the concentration of hazardous substances or the conduct of activities performed in certain locations. They may restrict or preclude certain remedial actions or may apply only to certain portions of the area of contamination.

2.3 SCREENING LEVELS FOR SOIL AND GROUNDWATER

Screening levels for soil and groundwater are presented in Tables 3-4 and 3-5. The development of these levels is presented in the following sections.

2.3.1 Groundwater

Groundwater screening levels were developed considering both protection of drinking water and protection of surface water. Groundwater samples were analyzed for conventional and inorganic analytes, which will assist in determining whether the groundwater should be considered potable according to WAC 173-340-720(2). In the cases of PCBs, however, surface water screening levels are lower than drinking water screening levels, so surface water screening levels are protective of both pathways.

Screening levels for water analytes were derived by reviewing ARARs for protection of drinking water and protection of surface water and evaluating the minimum ARARs to determine if they are sufficiently protective under MTCA. The following ARARs were included:

- Drinking water
  - Maximum contaminant levels (MCLs) established under the Safe Drinking Water Act (40 CFR 141)
  - MCLs established by the State Board of Health (246-290 WAC)
- Surface water
  - Water quality criteria (WQC) for freshwater and saltwater aquatic organisms published by the State of Washington (173-201A WAC)
  - WQC for freshwater and saltwater aquatic organisms and human health, ingestion of organisms only, under Section 304 of the Clean Water Act
  - WQC for freshwater and saltwater aquatic organisms and human health, ingestion of organisms only, established under the National Toxics Rule (40 CFR Part 131)

WQC for protection of human health did not include ingestion of water because the Lower Duwamish Waterway is not rated for drinking water (173-201A WAC).

The minimum MCL was evaluated to determine if it was sufficiently protective using MTCA Equations 720-1 and 720-2; it was considered sufficiently protective if the cancer risk did not exceed 1×10^{-5} and the hazard quotient did not exceed 1 (WAC 173-340-720(7)(b)). If the MCL was sufficiently protective, it was used as the drinking water screening level; otherwise, it was adjusted using Equations 720-1 and 720-2 as appropriate to achieve a cancer risk of 1×10^{-5} and a hazard quotient of 1. If there was no MCL for a water analyte, the minimum of the MTCA Equation 720-1 and 720-2 values was used.

The minimum WQC was evaluated to determine if it was sufficiently protective using MTCA Equations 730-1 and 730-2; it was considered sufficiently protective if the cancer risk did not exceed 1×10^{-5} and the hazard quotient did not exceed 1 (WAC 173-340-730(5)(b)). If the WQC was sufficiently protective, it was used as the surface water screening level; otherwise, it was adjusted using Equations 730-1 and 730-2 as appropriate to achieve a cancer risk of 1 x 10^{-5} and a hazard quotient of 1. If there was no WQC for a water analyte, the minimum of the MTCA Equation 730-1 and 730-2 values was used. Groundwater screening levels are presented in Table 3-4.

2.3.2 Soil

A number of different approaches for screening soil need to be addressed to identify appropriate soil screening levels. These are discussed below.

2.3.2.1 Direct Contact Exposure Pathway for Soil

MTCA Method B soil screening levels depend on whether the groundwater is impacted above groundwater screening levels. In areas of the site where groundwater is not impacted, an empirical demonstration can be used to eliminate protection of groundwater from consideration in setting soil screening levels. The following criteria must be satisfied for the empirical demonstration (WAC 173-340-747(9)):

- Groundwater concentrations are less than or equal to the groundwater screening level
- Soil contamination has been present sufficiently long that it would have reached groundwater by now if it were going to
- Site conditions will not change in the future so as to promote leaching.

For portions of the site where an empirical demonstration can be satisfied, soil screening levels are based on direct contact and the terrestrial ecological evaluation (TEE).

The following issues must be considered when developing a Method B soil screening level (WAC 173-340-740(3)(b)):

- Applicable state and federal laws (commonly referred to as ARARs)
- Environmental protection through the TEE (WAC 173-340-7490 through -7494)
- If a sufficiently protective ARAR is not available, the following issues must be considered:
  - Protection of groundwater (WAC 173-340-747)
  - Concentrations protective of human health through direct contact (Equations 740-1 and 740-2)
  - Under some conditions, the soil vapor pathway.

In addition, soil screening levels must not directly or indirectly cause violations of groundwater, surface water, sediment, or air screening levels (WAC 173-340-740(1)(d)). Finally, total cancer risks across all carcinogens present at the site must not exceed $1x10^{-5}$ (WAC 173-340-740(5)(a)). A schematic of the process is provided in Figure 2-1 (modified from Geoengineers 2008).

If the soil screening level for a metal was lower than the natural background concentration for the Puget Sound region (Ecology 1994) it was adjusted up to the natural background concentration (WAC 173-340-740(5)(c)).

For the direct human contact screening level, the ARAR for PCBs is TSCA. No other soil ARARs have been identified.

As noted above, ARARs must be considered in developing screening levels. If it can be demonstrated that the ARAR is sufficiently protective, the ARAR is used to establish the human health direct contact screening level (WAC 173-340-740(3)(b)(iii)). An ARAR is considered sufficiently protective if it is associated with a cancer risk of 1×10^{-5} or less (WAC 173-340-740(5)(b)). The TSCA screening level of 1 mg/kg total PCBs for high occupancy areas (40 CFR 761.61) is the appropriate ARAR to apply to a MTCA Method B unrestricted land use scenario. Inserting the TSCA screening level of 1 mg/kg into MTCA Equation 740-2, using the carcinogenic potency factor of 2 per mg/kg-day (Ecology 2010), and solving the equation for risk, we obtain a cancer risk of 2×10^{-6}. Because this value is less than 1×10^{-5}, the ARAR is considered sufficiently protective and does not need to be adjusted (WAC 173-340-740(5)(b)). The PCBs soil screening level for direct human contact is 1 mg/kg based on TSCA.

This approach is explained by Ecology (2001, pp. 132–133) as follows:

> The phrase "sufficiently protective" is intended to mean that the state or federal standard being used as the basis for a cleanup level meets the maximum acceptable levels of risk allowed under MTCA. For carcinogens, this means the standard is based on a level of risk that does not exceed one in one hundred thousand…. these provisions are not intended to require values derived using the Method B formulas to be used instead of ARARs. This is why the introductory paragraph to the Method B formulas in each of these Sections only requires use of the formulas if the ARARs are not "sufficiently protective."

This approach was used for deriving the Method B soil PCB screening level of 1 mg/kg for the Former Scott Paper Company Mill Site (Geoengineers 2008). This approach also is parallel to the approach for deriving Method B groundwater screening levels, in which MCLs are evaluated to determine if they are sufficiently protective. If an MCL is associated with a cancer risk of 1×10^{-5} or less, it is considered sufficiently protective and does not need to be adjusted (WAC 173-340-720(7)(b)).

2.3.2.2 TEE Exposure Pathway for Soil

A site visit and evaluation for potential TEE was conducted by Integral on July 28, 2010 (Appendix A). Based on this evaluation, it appears that the site qualifies for a simplified TEE but that the simplified TEE cannot be ended under current site conditions. Additional steps need to be taken to confirm this conclusion, including reviewing information regarding threatened or endangered plant and animal species for the vicinity of the property. If a simplified TEE is found to be appropriate, corresponded screening levels for this pathway (WAC 173-340-7492, Table 749-1) are 2 mg/kg for PCBs, 12,000 mg/kg for gasoline-range hydrocarbons and 15,000 mg/kg for diesel-range hydrocarbons[1] (Table 3-5).

2.3.2.3 PCB Soil to Groundwater Exposure Pathway

PCBs have been detected in groundwater in the southeast corner of the LLA. Protection of groundwater for PCBs includes the soil to groundwater (leaching) pathway and residual saturation in these areas.

To calculate screening levels for the leaching pathway, the following default soil parameter values were used:

Soil Characteristics

Parameter	Abbrev.	Units	Unsaturated	Saturated
Porosity	N	unitless	0.43	0.43
Water-filled porosity	theta w	unitless	0.3	0.43
Bulk density	rho b	kg/L	1.5	1.5
Fraction organic carbon	Foc	unitless	0.001	0.001
Dilution factor	DF	unitless	20	1

The groundwater screening levels used as input for the leaching model considered both protection of drinking water[2] and protection of surface water.[3] The following default chemical parameter values were used for the leaching calculations (Ecology 2010):

[1] The petroleum screening levels are qualified by noting that soil concentrations shall not exceed residual saturation at the surface.
[2] USEPA (2010a) primary drinking water standard maximum contaminant levels adjusted to 1×10^{-5} cancer risk (WAC 173-340-720(7)(b)).
[3] USEPA (2010b) water quality criteria for protection of human health via consumption of organisms.

Chemical-Specific Inputs

Chemical	Solubility mg/L	Henry's law Unitless	Koc L/kg	Groundwater Screening Level (µg/L) Drinking	Surface Water
PCBs	7.0E-01	NV	3.1E+05	5.0E-01	6.4E-05

NV = no value available

Using the lower surface water screening level, the screening levels calculated using MTCASGL11[4] for the soil leaching pathway are shown in the table below. Because the screening levels for PCBs in the saturated and unsaturated zones are below concentrations achieved with routine analytical methods, the screening levels are set at the practical quantitation limit (PQL) shown (WAC 173-340-720(7)(c)).

Leaching Soil Cleanup Levels for GTSP

Indicator Hazardous Substance	Leaching [a] Unsaturated	Saturated	Residual Saturation [b]	PQL
PCBs	4.0E-04	2.0E-05	> 220	0.03

Units in mg/kg.
NA = not applicable
[a] Based on protection of surface water.
[b] Soil saturation concentration, as calculated by MTCASGL11, used as a conservative lower bound estimate for residual saturation.

2.3.2.4 Other PCB Soil Screening Levels or Remediation Levels

Other screening levels/interim action removal levels used for PCBs in the NBF/GTSP area include those developed by SAIC (2006) and those proposed by Boeing for their adjacent interim action.

SAIC (2006) developed soil and groundwater screening levels that could be used to identify upland properties which may pose a potential risk of recontamination of Slip 4 sediments. These screening levels were also developed to be used to evaluate sediment recontamination risk for other Duwamish River drainage areas. PCB screening levels were developed for groundwater and soil as shown below.

[4] Microsoft Excel workbook for calculating cleanup levels for individual hazardous substances. http://www.ecy.wa.gov/programs/tcp/tools/toolmain.html

SAIC (2006) PCB Screening Levels

Groundwater to Sediment Screening Level (µg/L)		Soil to Sediment Screening Level (mg/kg-DW)			
CSL	SQS	CSL		SQS	
		Vadose	Saturated	Vadose	Saturated
1.5	0.27	1.3	0.065	0.24	0.012

CSL = cleanup screening level
SQS = Sediment Quality Standards

Boeing (Landau 2010) has proposed to remove accessible soil in locations near the boundary with the GTSP property with PCB concentration of 0.5 mg/kg or greater. SAIC's (2010a) review of the Landau (2010) work plan appears to be endorsing this level with their comment:

> PCBs in soil at concentrations greater than 0.5 mg/kg are known to be prevalent in the fenceline area at depths down to the range of 4 to 6 feet bgs. Historical groundwater depths in nearby wells GTSP-3 and GTSP-5 for the dry season (using 8/2/06 data) are approximately 4.1 ft and 4.6 ft below the well casing. Therefore, the water table in the fenceline area of NBF may be at this depth or even shallower during the proposed soil excavation. The proposed excavation would thus represent only a partial removal of PCB-contaminated soil in this area, and further (deeper) excavation would likely be required at a later date. To avoid the need for re-excavation, Boeing should excavate soil in the identified areas to depths contaminated with PCBs greater than 0.5 mg/kg, based on historical and recent soil sampling data, regardless of groundwater depth.

2.3.2.5 Summary of PCB Soil Screening Levels

Cleanup goals identified for the upcoming interim action will consider these screening levels to meet the interim action goals.

Summary of PCB Soil Screening Levels for GTSP

Pathway	PCB Screening Level (mg/kg)	Basis/Source
Soil in areas without groundwater impacts		
Soil to groundwater - Vadose	1	Method B -TSCA
Soil to groundwater - Saturated	1	Method B - TSCA
Soil in areas with groundwater impacts		
Soil to groundwater - Vadose	0.0004	Method B - MTCASGL11
Soil to groundwater - Saturated	0.00002	Method B - MTCASGL11
Soil to Sediment - Vadose CSL	1.3	SAIC (2006) screening level

Summary of PCB Soil Screening Levels for GTSP

Pathway	PCB Screening Level (mg/kg)	Basis/Source
Soil to Sediment - Vadose SQS	0.24[a]	SAIC (2006) screening level
Soil to Sediment - Saturated CSL	0.065[a]	SAIC (2006) screening level
Soil to sediment - Saturated SQS	0.012[a]	SAIC (2006) screening level
Boeing Remediation Level	0.5	Landau 2010
TEE	2	Simplified TEE
PQL	0.03	Laboratory method

[a]SSLs that are below the PQL are superseded by the PQL.

2.3.3 Petroleum Screening Levels for Soil and Groundwater

Because petroleum has not been detected in permanent monitoring wells in or near the LLA (GTSP-3, GTSP-4, and GTSP5), petroleum screening levels will be based on direct contact and the TEE. Results of volatile/extractable petroleum hydrocarbon (VPH/EPH) analyses are pending and may be used to calculate a Method B direct contact screening level for the final work plan. For this draft, screening levels are assumed to be 100 mg/kg for gasoline-range organics (GRO) and 2,000 mg/kg for diesel and motor oil-range organics (DRO+MO).

2.4 SOIL AND GROUNDWATER SCREENING

In this section, LLA soil and groundwater data are screened against the screening levels presented in the previous section. In addition to the data collected in LLA in 2010, historical data for which there is reasonable certainty about location are included. These data include data from Bridgewater (2001), Integral (2007) and Landau (2008). The data collected in 2010 have not been validated and some changes to values and qualifiers may occur with the data validation. Appendix B contains the data and includes frequency of detection, minimum and maximum detected and non-detected values, screening levels, number of samples exceeding screening levels and ratios of screening level exceedances.

Of 240 chemicals evaluated in the soil screening tables, four exceed screening levels as summarized below:

Analyte	Frequency of Detection	Screening Level (µg/kg-dw)	Number of Samples Exceeding Screening Level	Ratio of Maximum Detected to Screening Level	Ratio of Maximum ND to Screening Level
Total PCBs (TSCA)	92 / 167	1,000	35	530	0.05
Arsenic	16 / 31	7	15	2	3
Gasoline Range Hydrocarbons	16 / 71	100	7	27	0.2
Diesel and Motor Oil Range Hydrocarbons	50 / 72	2,000,000	1	1.3	0.05
Carcinogenic PAHs (BaP TEQ)	15 / 52	140	2	3	0.5

BaP = benzo(a)pyrene
ND = nondetected concentration
PCB = polychlorinated biphenyl
PAH = polycyclic aromatic hydrocarbons
TEQ = toxicity equivalencies

There are five wells in the LLA: GTSP-5, LLATW01, LLATW02, LLATW03, and LLATW04. PCBs exceed groundwater screening levels in all of these wells except LLATW02. As noted in the previous section, in areas where groundwater is affected by PCBs, soil screening and cleanup levels are lower than the Method B - TSCA value shown above.

2.5 RECOMMENDATIONS FOR LLA INTERIM ACTION REMOVAL LEVELS

This section provides a summary of site conditions and proposes soil interim action removal levels for the LLA interim action.

Site characterization information indicates the following:

- PCBs, arsenic, DRO+MO, GRO, and cPAHs have been detected in soil above screening levels in the LLA.
- Groundwater affected by PCBs is restricted to the southwest corner of the LLA. Petroleum and cPAHs have not been detected in groundwater in wells in or near the LLA. Arsenic has not been detected in groundwater in or near the LLA at concentrations above the screening level.
- It is likely that groundwater is similarly affected beneath adjacent property leased by Boeing where water results from catch basin CB 187A had a PCB concentration of 0.74 µg/L and water was observed to be entering the catch basin in the dry season (i.e., the water was not attributable to stormwater runoff; SAIC 2010b).
- PCBs in soil along the southwest fence line range up to 3,800 ppm (SCL-IA08).

- PCBs greater than 2,000 mg/kg have been detected in soil near the southern fence line on the adjacent Boeing-leased property.
- Subsurface soil consists of predominantly silty sand and gravel fill overlying a clean fine to medium sand. The boundary between the fill and the sand is near the water table.
- Results to date show that PCB concentrations greater than 1 mg/kg are limited to the upper 6–8 ft of soil. These depths roughly correlate to within a couple of feet at or below the water table and the base of the fill. PCBs greater than 1 mg/kg do not extend to these depths at all locations.
- PCBs are detected as deep as 14 ft (GTSP-5).
- During well development, no significant drawdown occurs while pumping at a rate of 1.5 gallons per minute (gpm) indicating that excavations below the water table will produce significant water (slug tests pending) and excavation side walls below the water table will be unstable without engineered support.

The City proposes to remove soils in the LLA containing PCBs exceeding 1 mg/kg in areas where groundwater is not affected. In areas where the groundwater is affected, the City proposes to remove soils to an elevation of approximately 6.5 ft above North American Vertical Datum of 1988 (NAVD88) (a depth of 6–10 ft). This targets removal of soil with PCB concentrations exceeding 0.3 mg/kg. These interim action removal levels directly address the direct contact screening level based on TSCA in areas where groundwater is not affected by PCBs. In areas of affected groundwater, the depth of removal takes into consideration site excavation conditions and removal of a very large proportion of the PCB mass which is expected to have a correspondingly beneficial effect on groundwater quality. The interim action removal levels for arsenic, DRO+MO, GRO, and CPAHs (benzo(a)pyrene TEQ) are 7 mg/kg, 2,000 mg/kg, 100 mg/kg, and 0.14 mg/kg, respectively. The DRO+MO detection above screening levels is co-located with GRO and total PCBs exceedances of screening levels (LLASB05-8) and thus will be addressed during the interim action. Carcinogenic PAH detections above screening levels are also co-located with total PCBs exceedances of screening levels (LLATW01-5 and LLASB05-8) and will also be addressed during the interim action. GRO above screening levels extends beyond the PCB removal area in limited areas will be addressed as part of this interim action, and is discussed in the definition of the removal area boundary (Section 2.6). Arsenic also extends beyond the PCB removal area, but it appears to be part of a larger area exceeding screening levels in the South Yard Area and will be addressed during remediation of the South Yard Area.

2.6 REMOVAL AREA BOUNDARY

EVS-Pro software version 9.42 was used to develop a three-dimensional (3D) model of total PCBs and TPH (only GRO[5]) in soil and a separate model of total PCBs in groundwater for the LLA and the South Yard at the site. EVS-Pro software is produced by C Tech Development, which is verified by EPA's Environmental Technology Verification Program.

The 3D model developed with EVS-Pro uses a kriging algorithm to interpolate the soil and groundwater data. Kriging is a geostatistical method that minimizes the estimated variance of a predicted point with the weighted average of its neighbors. The EVS-Pro Adaptive Gridding option was employed in the 3D kriging interpolation. This option ensures that the input data are honored and minimizes the potential for over- and under-prediction in the kriging estimates. The X and Y resolution in Krig 3D Geology were set to 100 grid nodes and the Z resolution in Krig 3D was set to 35 nodes within the model domain. The Favor Max Values and Proportional Gridding options were also selected.

The soil data for the kriging analysis consisted of 240 total PCB soil samples from the following studies:

Soil Data Sources

Study	Number of Samples
2010 site characterization (Integral 2010b)	136
Bridgewater Phase II (2002)	18
Interim Action Confirmation Samples (Integral 2006)	23
Landau Sampling (Landau 2008)	34
Monitoring Well installation (Sampled July 2006).	29

Eighty-nine TPH (GRO) soil samples and 11 groundwater samples (Integral 2010b) were used for the TPH and groundwater kriging analyses. Non-detect samples were identified with a non-detect flag. Figures 2-2, 2-3, and 2-4 present total PCBs in soil, TPH in soil, and total PCBs in groundwater used in the kriging analysis, respectively. These data were imported into a groundwater chemistry file (.gwc) EVS format for the 3D Krig module and processed in a Log10 base. The model used default values for soil porosity, soil density, and anisotropy.

Arsenic, although it exceeded screening levels, was not included in the definition of the removal area boundary. Data for arsenic in soils are presented in Figure 2-5. As indicated in this figure, arsenic is limited in extent to the northern portion of the LLA. Furthermore, preliminary results

[5] Gasoline-range organics were the only TPH samples that exceeded the interim action removal levels beyond the removal area for total PCBs.

from the July 2010 site characterization indicate that arsenic extends into the South Yard. Therefore, elevated arsenic levels will be addressed during remediation of the South Yard.[6]

The geologic model domain consists of surface elevations and elevation values at groundwater surface (July 2010) and the lower depth of boring and monitoring wells. The combined data were converted to a geology multi file (.gmf) that defines the surface elevation and subsurface elevations. The file was used as input for the 3D Krig Geology module in EVS. The extent of the model was constrained horizontally by the boundaries of the LLA and adjacent South Yard. The boundaries were imported into EVS using the Read Vector GIS module. The Area Cut module was used to subset the plumes to a given boundary extent.

Figure 2-6 presents the results for the groundwater kriging analysis to determine the boundary of the 0.1 μg/L total PCB groundwater plume. This boundary represents the area targeted for soil removal down to an elevation of 6.5 ft NAVD88.

Isovolumes for soil were derived using the Volumetrics module connected to the Plume Volume Model in EVS-Pro. Isovolumes were calculated for total PCBs equal to or greater than 1 mg/kg and 50 mg/kg. These isovolumes were exported to shapefile format to derive areal extent and total depth in ArcGIS. Figure 2-7 presents the aerial extent and depth of soils that have total PCB concentrations ≥ 50mg/kg and will require disposal as a TSCA-regulated PCB remediation waste. Figure 2-8 presents the aerial extent and depth of soils that have total PCB concentrations ≥ 1 mg/kg. This boundary represents the volume of PCB removal outside the area where groundwater is impacted by PCBs.

The previously described methods for total PCBs in soil were applied to GRO to derive the 100 mg/kg isovolume in the LLA. Figure 2-9 presents the aerial extent and depth of soils that have GRO concentrations ≥ 100 mg/kg. This boundary represents the removal area boundary to address TPH in soils in the LLA.

The modeled removal boundaries were conservatively used in the development of the proposed excavation prisms described in Section 3.

[6] Elevated arsenic concentrations that are within the footprint of total PCB concentrations ≥ 1mg/kg (e.g. LLASB05-8) will be removed as part of this interim action.

3 PRELIMINARY DESIGN

3.1 PROPOSED EXCAVATION CONFIGURATION

Soil excavation and offsite disposal is the proposed remedy to address soils contaminated with PCBs and GRO in the LLA of the GTSP property. Soil within designated areas will be excavated, temporarily stockpiled (as needed), and loaded into haul trucks and/or roll-off containers for disposal at the appropriate facility. It is anticipated that the soil can be characterized for waste disposal on the basis of existing data. In the event that verification sampling of excavated materials is required by the disposal facility, then sampling of stockpiled material may be required.

Certified clean fill materials will be imported to backfill the excavated areas, and the site will be restored to original surface conditions. Due to the fast-track schedule, this IAWP is limited to a conceptual level of detail. Final design details and specifications will be prepared in the near future in concert with the designated construction contractor and incorporated into the final SOW.

In general, it is assumed that the removal will be conducted in two phases. Phase 1 will consist of first installing sheet pile walls to isolate the GTSP property from adjacent properties and to enclose the area with groundwater contamination. Following sheet pile installation, soils with total PCB concentrations equal to or greater than 50 mg/kg will be removed. Phase 1 is presented in Figure 3-2. Phase 2 will consist of removal of soils in the area with groundwater contamination to an elevation of 6.5 ft NAVD88, removal of all soils with total PCB concentrations greater than or equal to 1 mg/kg, and removal of all soils with GRO concentrations greater than or equal to 100 mg/kg. Phase 2 is presented in Figure 3-3.

3.1.1 Site Plan, Topography, and Geology

The site plan, including salient surface features, is shown in Figure 3-1. Both the site preparation and restoration will address the current surface features with the intention of preserving the current site characteristics. The general area to be excavated lies in the southwest corner of the property and a narrow section along the southern boundary. Figure 3-1 also shows the surface topography of the GTSP property as determined in a 2006 land survey conducted by SCL. South of the steam plant building the land surface slopes down gently to the southeast. This provides a reasonably level area for staging materials and equipment. The slope becomes steeper down to the southeastern and southwestern property lines. A slight swale runs from the eastern fence line along the southeastern boundary. Surface flow has been observed along this swale during heavy rain events. Construction will take place during the dry season. However, stormwater plans will anticipate a heavy rainfall event and incorporate best management practices for stormwater handling.

Generally, the soil types beneath the LLA consist of fill underlain by poorly graded sands (classified as "SP" in the U.S. Geological Survey Unified Soil Classification System) interpreted to be native river sands. The bulk of the LLA in the shallow depths (0–3 ft bgs) consists of silty sands (SM), with variations ranging from poorly-graded gravels (GM) to clayey silts (ML). There are some small areas of organic material (PT, predominantly coal) at depths ranging from 1 to 7 ft bgs, but their horizontal or vertical extents are typically very limited.

The fill is highly variable and soil types include silty gravels (GM) to inorganic silts, very fine sands, and clayey silts (ML). One area of vertical consistency worth noting is at LLASB09 (see Figure 2-2) where silty gravels (GM) are noted from 0 to 8 ft bgs (with some silty sands [SM] noted at 1.5 to 2 ft bgs). Brick fragments and other debris are common in this location, possibly indicating a debris pile. However, brick, wood and coal fragments are noted at depths ranging from 1 to 8 ft bgs in various parts of the South Yard Area and LLA.

Beginning at 2 ft bgs, the prevalence of poorly graded sands (SP) increases with depth. Below 8 ft bgs, SP is fairly consistent across the LLA down to the deepest boring level of 30 ft bgs. There are thin layers (or lenses) of clayey silts and silty clays (ML and CL, respectively), but they do not appear to have wide horizontal extents.

Wood debris was found in thin layers at a depth of 12–14 ft bgs in eight bore holes in the LLA (LLATW02, -03 and -04 and LLASB02, -03, -05, -06 and -12; Figure 2-2), but wood debris was not found at this depth in the nine other LLA boreholes. If this layer derives from historical wood debris, it may be an indicator of the original banks of the Duwamish River before it was straightened in the early 1900s. Further details of the subsurface stratigraphy can be found in the LLA Data Report (Integral 2010b).

3.1.2 Sheet Piling and Other Containment

In some places where sloping of the excavation sidewalls is not feasible (i.e., property boundary), sheet piling will be necessary to prevent adjacent subsurface material from falling into excavated areas. Trench boxes may also be considered as an alternative to sheet pile for excavation support. In other places, sheet piling may be used to separate soils with total PCB concentrations greater than or equal to 50 mg/kg from soils with total PCB concentrations less than 50 mg/kg. Segregating soils with high contamination levels in this way will minimize the amount of soil that will require special handling under TSCA regulations. A third use of sheet piling is to enclose an area that is to be excavated to a depth substantially below the groundwater table to minimize that amount of dewatering that will be required. After sections of fence are removed and appropriate dewatering measures are in place (see Section 3.2.1.2), sheet piling will be installed where necessary to depths of up to approximately 16 ft bgs[7] along

[7] Estimated sheet pile depths presented in the text and on the figures are based on preliminary calculations. Final dimensions of necessary sheet piling will be incorporated into the final SOW.

the property line (see Figure 3-2). If necessary to control dewatering, additional sheet piling may be used at designated cross sections to limit the size of the excavation open at a given time. The final configuration of the required shoring elements, either sheet piling or trench boxes, will be developed with the construction contractor and integrated into the final SOW.

3.1.3 Slope Stability

The excavation cutback line will be determined based on the required slope angle and the necessary excavation depth. Based on the heterogeneous nature of the top 6–8 ft bgs, the slope may vary based on field observations. Sheet piling and trench boxes will be used in areas where proper sloping cannot be established within the surface constraints. For preliminary estimates presented in this IAWP, a 2:1 (H:V) slope was assumed.

3.1.4 Limits of Excavation

Excavation prisms have been established based upon the cleanup for total PCBs and GRO derived from applicable regulations (see Section 2). Other factors that also determined excavation limits include anticipated cutback slopes, and administrative buffers around known contamination. Figures 3-2 and 3-3 illustrate the areas to be excavated.

Some soil with contamination at or above TSCA limits for special waste handling (e.g., 50 mg/kg for total PCBs) lies below soil with concentrations either non-detect or less than the TSCA limits. Unless there is a clear separation (such as the geotextile layer in areas of prior remedial actions or other visual marker), all of the soil above and within 5 ft horizontally of the soil above of TSCA limits will be excavated and disposed of as soil above TSCA limits. Similarly, soils with contaminant concentrations either non-detect or below cleanup levels that are above or adjacent to soils with low level contamination (i.e., less than TSCA limits) will be treated as contaminated soil below TSCA limits. No existing site soils will be used as backfill on the site.

3.1.5 Preliminary Excavation Quantities

Excavation quantities were estimated using the dimensions of the prisms described in Section 3.1.4 and the topographical surface. A factor of 1.15 was used to convert the volume as measured in-place to the expected bulk volume after excavation. A water table surface was estimated to identify the area of wet excavation based on historical water levels measure in site wells during the summer season. This surface was used to estimate the volume of wetted soils generated. Wetted soils will be allowed to dewater in staged piles set on HDPE liner prior to loading and transport,[8] so it is assumed there will be no significant difference in bulk density

[8] Water generated from the dewatering of excavated material will be collected and managed in the same manner as water generated during the dewatering of the excavation as described in Section 4.9.

for wet and dry soils. A bulk density factor of 1.62 tons per in-place cubic yard was used to convert the bulk volumes to tonnage for transportation and cost estimation purposes. The volume of soil that is expected to have a PCB concentration of 50 ppm ore greater was estimated as well.

Soil Concentration	In-Place Cubic Yards[a]	Tons[b]
Total PCBs ≥ 50 mg/kg (TSCA)	125	205
Other (total PCBs ≥ 1.0 mg/kg and/or GRO ≥ 100 mg/kg)	2980	4830

[a] Rounded to the nearest 10 cubic yards
[b] Rounded to the nearest 5 tons.

An estimate of the volume of soils to be excavated was prepared using AutoCAD Civil 3D 2010. The software calculation was based on the excavation plan illustrated in Figures 3-2 and 3-3 and a triangulated irregular network model of current site topography, prepared in Civil 3D using data obtained from a June 2006 site survey conducted by the City.

3.2 SOURCE CONTROL

Source control is the process of stopping or reducing the migration of known or suspected contamination from one area that could potentially contaminate or recontaminate another area. Source control for this interim action involves both efforts to insure that contamination remaining on the site does not migrate offsite, and efforts to insure that off-site contaminants do not migrate and contaminate clean material brought onto the site.

3.2.1 Prevention of Contaminant Migration Offsite

Potential pathways for contaminants to migrate offsite include stormwater runoff, dewatering effluent and fugitive dusts during construction, and offsite groundwater migration after construction. Because all of the known PCB-contaminated soil (≥ 1mg/kg) will be removed from the LLA, it is not expected that stormwater runoff can be a pathway for offsite migration after construction is completed.

3.2.1.1 Construction Stormwater

Prior to construction, a stormwater pollution prevention plan will be prepared to address all anticipated stormwater issues. The plan will include measures that will minimize stormwater entering an open excavation, and that will prevent stormwater from carrying any material offsite from excavated areas or stockpiles. Any stormwater in an open excavation area that does not infiltrate and needs to be removed to proceed with construction will be treated onsite before discharge to the sanitary sewer.

3.2.1.2 Dewatering

Areas of excavation that go below the water table may require some form of active or passive dewatering. Passive dewatering occurs when wet excavated soils are allowed to drain back into the open excavation or groundwater accumulating in excavation is pumped out during excavation. Active dewatering requires advanced preparation to lower the water table to a sufficient elevation prior to excavation. Given the small area of excavation below the water table, passive means of dewatering will be used. Any collected water from dewatering the excavation will be treated on site before discharge to the sanitary sewer as described in Section 4.9.

3.2.1.3 Fugitive Dusts

Given that the construction will occur during the dry season, dust is likely to be created from vehicular and heavy equipment activity. Best management practices include suppressing dust by spraying surface soils with water and decontaminating vehicle tires and equipment before they leave the site.

3.2.1.4 Groundwater

Removing the known PCB contamination in the subsurface soil of the LLA will reduce the likelihood of contaminants leaching further into the groundwater. Post-remediation groundwater monitoring will identify any trends of groundwater contaminant concentrations in excess of cleanup levels. If additional groundwater contaminant concentrations become a concern after this interim action is completed, corrective measures will be reviewed as part of the final site remedy selection.

3.2.2 Prevention of Contaminant Migration Onsite (Recontamination)

One of the objectives of this interim action is to implement source control measures that will reduce the risk of recontamination of clean soils imported to backfill the excavation. Such source control measures will address possible onsite migration of contaminants with stormwater or groundwater flow, or by contamination left in-place on properties adjacent to the GTSP.

3.2.2.1 Stormwater

Historically, stormwater has been observed to flow onto the GTSP property during heavy rain events. This stormwater flow can potentially carry contaminated particulate matter that remains on the GTSP property, particularly due to ponding and settling in the southwest corner. Stormwater management practices will be implemented prevent new contamination from migrating onsite through the stormwater pathway. Such practices may include silt fences, diversion berms, or infiltration trenches. The final selection and design of stormwater management practices will be conducted prior to mobilization for this interim action.

3.2.2.2 Adjacent Subsurface Contaminants

As mentioned in Section 3.1.2, sheet piling can be used to prevent soil and groundwater contaminants in adjacent offsite areas from migrating onto the remediated GTPS property. Permeable barriers with adsorbent activated carbon would also serve to prevent contaminants from flowing onsite or offsite without any appreciable restriction of groundwater flow. Decisions about source control actions will be finalized before implementation of this interim action.

4 PRELIMINARY SCOPE OF WORK

This SOW is based on a conceptual design for the interim action. Once final design details have been established, a final SOW, along with relevant plans and specifications, will be provided to the construction contractor.

4.1 CONSTRUCTION COORDINATION

4.1.1 Roles and Responsibilities

SCL will be responsible for overall management of the interim action construction activities. Integral will provide project design and construction oversight support. NRC Environmental Services will serve as the remedial construction contractor. Contact information for the key project representatives from each of these organizations is shown below.

Project Manager
TBD
City of Seattle, Seattle City Light
(206) 233 -2192
E-mail

Design and Construction Oversight Support
TBD
Integral Consulting Inc.
(206) 230-9600
E-mail

Remedial Construction Contractor
TBD
NRC Environmental
(253) 896 -0020
E-mail

The project site is adjacent to property leased by Boeing. The contractor shall gain approval on intended uses of Boeing-leased property from the Boeing representative prior to commencing work.

Boeing Representative
TBD
Boeing Environmental

(206) 898 -0438
E-mail

4.1.2 Project Meeting and Communications

The contractor will coordinate a project kickoff meeting prior to initiating construction activities. The meeting will be attended by the contractor's project manager and superintendent, SCL, its design consultant (Integral), and a representative from Boeing. The meeting will be held to review the interim action design and discuss the contractor's proposed methods for completing the work. Specific discussion topics will include, but not be limited to:

- Review of interim action design objectives, plans, and specifications
- Contractor's proposed methods for excavation, soil handling, transportation, and disposal, including staging areas and decontamination zones
- Contractor's proposed methods for shoring (e.g., sheet piling)
- Contractor's proposed methods for stormwater management
- Contractor's proposed decontamination methods and procedures
- Placement of temporary fencing
- Contractor's proposed method of re-installing security fence
- Access limitations and requirements to SCL property and to Boeing property
- Contractor's project-specific health and safety plan
- Contractor's proposed waste transportation plan and selected disposal facility
- Construction schedule.

4.1.3 Daily Meetings

Contractor shall hold daily "tailgate" meetings to briefly review plans for the day's upcoming work activities. Daily meetings shall be attended by the contractor's work crew and SCL or its designated representative (if desired).

4.1.4 Recordkeeping

The contractor shall maintain a daily log of construction activities. The log shall include, but not be limited to, the following information:

- Weather conditions
- List of crew and equipment

- Summary of construction activities
- Sketches indicating areas worked (limits of excavation, backfilling, etc.)
- Estimate of excavation/disposal quantities
- Listing of construction material used (fill material, geotextile fabric, etc.)
- Waste manifest copies.

4.2 MOBILIZATION

The contractor will transport (or arrange delivery for) all necessary personnel, equipment, and materials to a designated staging area to be approved by SCL. The contractor will assume that no utilities will be provided for the work, and that it is the responsibility of the contractor to provide all required electricity, water, communications, and sanitary facilities.

4.3 SITE PREPARATION

The contractor will be responsible for all necessary site preparation measures. These measures include, but may not be limited to, activities listed in the following sections.

4.3.1 Utility Locate Survey

The contractor will conduct a utility locate survey for all areas subject to ground penetration that were not recently surveyed for the site characterization work. Detected utilities and any anomalies shall be identified with labeled pin flags. The location information derived from the survey shall be provided on a base map and submitted to the SCL project manager for the project record.

4.3.2 Removal of Surface Features

4.3.2.1 Existing Fence Removal

The contractor will remove the existing security fence in the vicinity of the proposed excavation along the retaining wall, as necessary to access the work area. Prior to removal, the contractor will record the position of the fence relative to the retaining wall, located along the western property boundary line, and mark the spacing of the fence posts on the top of the retaining wall. The contractor shall also note the construction details (i.e., fence posthole diameter and depth, post dimensions). These dimensions and details will be necessary for reinstalling the fence as described in Section 4.6.4. The fence fabric shall be preserved for reuse, unless it is damaged or becomes damaged in the removal process. Because fence posts are being removed from areas requiring remediation, the fence posts and concrete bases should be cleaned of any soil before being disposed of with other construction debris.

4.3.2.2 Small Scale Railroad Track

In the South Yard Area lies an oval small scale model railroad track. It is used periodically by a local model railroading club or on special occasions. To the extent that the excavation may interfere with the track placement, portions of the track will be removed and stored securely on site. This will prevent damage to the track from excavation activities and construction vehicle traffic. The track will be installed again to its previous condition as part of the site restoration.

4.3.3 Installation of Temporary Fencing

The contractor shall install a temporary security fence around the project work area. The purpose of the fence is to maintain the current level of security to the Boeing leased property, and shall be fabricated and installed in a manner acceptable to Boeing. The fence may restrict vehicular traffic, but shall not block pedestrian traffic along the access roads on the Boeing leased property. The fence will have adequate stabilizers (i.e., perpendicular bracing) to ensure the integrity of the fence under anticipated working and weather conditions (i.e., wind). Installation will not require ground penetration on the Boeing leased property or damage to any other surface improvements on Boeing leased property.

4.3.4 Environmental Protection

The contractor will set up zones as appropriate to prevent incidental migration of contaminants off site. Entrance into these zones will be restricted to personnel with 40-hour Hazardous Waste Operations (HAZWOPER) training and certification. The contractor will provide appropriate demarcation and signage to the extent necessary to protect the health and safety of workers and the general public. The decontamination zone will have appropriate containment devices to collect rinsate and soil resulting from the decontamination of equipment and personnel.

The contractor is responsible for all environmental impacts resulting from its activities at the site. The contractor will abide by the following environmental protection measures, and any other measures as directed by SCL:

- Fuel-powered equipment shall be fueled off-site whenever possible. In the event that refueling is required on-site, the refueling shall be performed over an impermeable liner with suitable spill containment measures (i.e., berms, sorbent booms).
- No fuel is to be stored onsite overnight.
- Temporary fuel storage containers, generators and other stationary power equipment will be placed on impermeable liners with suitable spill containment measures.

- Contaminated equipment will be decontaminated at the end of each day and covered or stored as appropriate to avoid exposure to precipitation.
- Mechanical means of decontamination (i.e., dry brushing, knocking, vibratory action) will be used whenever practical so as to minimize the production of rinsate for collection and disposal. However, such mechanical means will not be used if airborne dusts are generated and observed to be drifting off-site or into the breathing zone of workers.
- Airborne fugitive dust shall be prevented through best management practices, including stopping work during high winds, water spray on bare soil in traffic areas, and dumping dry soil from the lowest height possible.
- Construction vehicle tires will be dry brushed of any loose soil in an appropriate containment zone before leaving the site.

4.3.5 Soil Staging Area (waste and clean material)

The contractor will construct a soil staging area for filling soil transportation containers (e.g., roll-off bins, truck bed). This staging area will include a means of containing any soil spillage, and will prevent any stormwater erosion of soil piles.

4.4 EXCAVATION METHODS AND MATERIALS HANDLING

The contractor shall excavate contaminated soil to the limits indicated in the attached figures (Figures 3-2 and 3-3). Excavated areas will have adequate slope protection, trench boxes or sheet piling as necessary to protect the integrity of the excavation.

All excavated soil and organic material will be placed immediately in a soil transportation container for offsite disposal. Other than for dewatering purposes, no contaminated soil is to be stockpiled onsite (outside of the transportation containers). If the contractor encounters any unexpected bulk items (e.g., large stones, debris), the contractor will remove them and place them in the soil transportation container if they can be loosened, making note of the encounter. Otherwise, the contractor will contact SCL for further direction.

For the area of prior remediation along the west retaining wall and curb, clean backfill wrapped in geotextile fabric will require removal to reach the lower level contamination. To the extent feasible, the backfill material will be handled as nonhazardous material and segregated accordingly for disposal. The retaining wall will not be disturbed during these activities.

Several monitoring wells and/or temporary well points are located within the footprint of the excavation areas. All monitoring wells shall be abandoned in accordance with all state and local regulations prior to commencement of excavation.

4.5 BACKFILL

The backfill will be placed to restore original topography in maximum 12 in. thick lifts and compacted with a vibratory plate compactor, or other means approved by SCL. Particular care will be taken to avoid damage or displacement of the retaining wall along the western edge of the property. Water will be applied to the loose backfill, and the material will be compacted to the maximum density practicable, with a minimum of three passes of a vibratory compactor (or similar device approved by SCL).

With the exception of the curbed segment of the retaining wall, the backfill will continue until an elevation 4 to 6 in. below the original surface elevation to allow for placement of topsoil material. At the curbed section of the retaining wall, the backfill will continue to an elevation approximately 2 in. below the top of the curb to allow for placement of gravel drain rock. The final lift along the retaining wall will be sloped approximately 5 percent, to drain away from the wall.

The backfill material shall meet the material requirements as specified in Washington State Department of Transportation (WSDOT) Specification 9-03.9(3) Crushed Surfacing, Base Course (2006). The contractor may submit an alternative gradation for approval by SCL. In addition, the backfill material will meet the following requirements:

- Certification will be provided that the imported material was obtained from a commercial quarry or pit permitted by the State of Washington.
- Certification will be provided of gradation and compliance with these specifications.
- Certification will be provided to document that material is free of contaminants. Such documentation may include existing chemical analyses provided by supplier, or project-specific testing and analyses, to include PCBs, metals, polycyclic aromatic hydrocarbons, and total petroleum hydrocarbon with methods as approved by SCL.
- Gravel composition will be 100 percent virgin material.
- Gravel will not contain any recycled material.
- Organic soil and clay content shall be minimal.

The drain rock backfill material shall meet the material requirements as specified in WSDOT Specification 9-03.12(5) Gravel Backfill for Drywells (2006). The contractor may submit an alternative gradation for approval by SCL.

4.6 SURFACE RESTORATION

Upon completion of the backfilling, compaction, and geotextile placement, the contractor will restore the surface to conditions similar to those prior to construction. This includes topsoil placement, hydroseeding, and reconstruction of the railroad tracks and site security fence.

4.6.1 Topsoil Placement

The contractor will spread a 4- to 6-in. layer of topsoil over the surface of the excavation area. Only hand tools will be used on top of any geotextile fabric if used. The surface of the topsoil will be sloped to drain away from the retaining wall and lightly compacted with a single pass of a vibratory plate compactor. The topsoil specification will be provided with the final SOW.

4.6.2 Hydroseeding

The contractor will apply hydroseed to the excavation area and any other areas disturbed by the contractor's construction activities. The contractor will apply the seed mix in such a way that it inhibits erosion until the grass is established (i.e., with fertilizer, mulch, and tackifier). The seed mix specification will be provided with the final SOW. The contractor may propose an alternate seed mix for approval if it provides vegetation that is temperature and drought resistant, is indigenous, requires little maintenance, can survive in low-nutrient soil, and will adequately control erosion.

4.6.3 Restoration of Railroad Tracks

The original railroad tracks will be returned to their previous placement and condition. The contractor will coordinate with a person knowledgeable of the track specifications to ensure the proper gauge is set. Ballast and railroad ties will be replaced if necessary.

4.6.4 Restoration of Security Fence

Upon completion of earthwork activities, the contractor will restore the site security fence to its pre-construction condition. The contractor will replace all fence materials that could not be salvaged, including fence posts, with equivalent materials, as approved by SCL. The fence restoration plan must also be approved by a Boeing representative. The fence posts will be installed in accordance with manufacturer's recommendations to ensure structural stability, and in a manner that does not compromise the integrity or performance of the clean backfill material. This may require preparation steps in the backfilling process. Details of the fence post installation will be discussed at the project kick-off meeting.

4.7 STORMWATER MANAGEMENT

4.7.1 During Construction

The contractor will employ best management practices to protect the environment from unintended releases of, or contact with, contaminants. Such practices may include, but not be limited to, the measures listed below. The contractor will assume full responsibility for the prevention of off-site contaminant releases throughout the duration of the work, and thus may propose alternative measures for approval by SCL.

- The area immediately surrounding the excavation opening will be covered with plastic sheeting to the width necessary to capture fallout from excavation activities, and as necessary to capture runoff in the event of sudden storm event.
- A containment area will be constructed on the pavement area along the active excavation zone to capture runoff or seepage from the excavation. The containment area may consist of a sandbag berm and plastic lined catchment area.
- The contractor will be prepared to collect and dispose of any runoff from the active work area.
- All catch basin grates in the immediate vicinity of the work area will be lifted, fitted with geotextile fabric, and placed back into position for the duration of the project. Upon completion of the work, the geotextile fabric shall be removed and disposed. In addition, any existing filter socks within the storm drains shall be replaced upon completion of the work.
- Sorbent socks will be used as a means of secondary containment where necessary.

4.7.2 Post-construction

Stormwater management practices will be implemented in order to prevent new contamination from migrating onsite through the stormwater pathway. Such practices may include silt fences, diversion berms, or infiltration trenches. The final selection and design of stormwater management practices will be conducted prior to mobilization for this interim action.

4.8 SOLID WASTE CHARACTERIZATION, TRANSPORTATION, AND DISPOSAL

The contractor will be responsible for all waste streams generated in the course of the work in accordance with applicable regulations including, but not limited to, TSCA and U.S. Department of Transportation (DOT). This includes but is not limited to contaminated soil, decontamination rinsate, solid wastes, excess materials, collected stormwater, excavation dewatering water, and sanitary wastes generated by personnel involved in the work.

The transporter of the waste will be duly qualified and certified under DOT regulations. In the event of spillage of waste en route to the disposal facility, the transporter will notify SCL's project manager immediately.

The primary waste stream will be the excavated soil presumed to be contaminated with total PCBs at concentrations either ≥ 1 mg/kg and < 50 mg/kg (lower concentration) or ≥ 50 mg/kg (higher concentration) for TSCA waste. The higher concentration soil (and any encountered bulk debris or materials contaminated in the course of work) shall be transported for offsite disposal at an approved TSCA landfill. The lower concentration waste will be transported to an approved disposal facility for non-hazardous waste. The contractor shall prepare manifests for disposal for signature by SCL.

4.9 WASTEWATER TREATMENT AND DISPOSAL

Wastewater is anticipated to be generated onsite by three distinct processes: excavation dewatering, excavated soils dewatering, and, potentially, stormwater that comes into contact with excavated materials. Wastewater generated onsite will be collected and treated in a three-part series consisting of a settling tank, a particulate filter to reduce suspended solids and a granular activated carbon filter to reduce chemical contaminants to below allowable limits. The treated wastewater effluent will be regulated by the King County Industrial Waste program in compliance with the Clean Water Act and the General Pretreatment Regulations (40 CFR 403). A Construction Dewatering Request form will be submitted along with coordination with Seattle Public Utilities. Once the discharge permit has been approved, treated effluent will not be discharged without the required sampling and analysis. The treated effluent discharge rate will not exceed 50 gpm if the construction is conducted during the dry season (May through October) or 17 gpm if conducted during the wet season (November through April).

4.10 DEMOBILIZATION

Upon completion of the work, SCL will conduct a site walk to inspect the final condition of the site and to identify any additional work required. Once SCL has accepted the work as complete, the contractor will commence demobilization. Demobilization will include, but is not limited to, the following tasks:

- Disassembly and removal of the temporary fence
- Removal of sanitary facilities
- Removal of any excess material quantities

- Removal and proper disposal of all materials used for the decontamination, exclusion, and transition zones
- Removal and proper disposal of all waste and debris from the site.

4.11 RECORD SURVEY

The contractor will conduct a record survey of the excavation. The contractor may use the existing groundwater monitoring well monuments as reference points for measurements. Measurements will include cross-section dimensions of the completed excavation at 10-ft intervals from east to west.

The width of the excavation will be measured at the base and the top. The edge of asphalt, if extending beneath the wall, also shall be recorded. The depth of the excavation will be measured at each interval using a survey level, taking measurements at the center of the excavation, the sides of the excavation, and the top of the excavation slope.

Results of the survey will be documented in a plan sketch, clearly showing the location and value of all survey points and associated measurements.

4.12 WORK TO BE COMPLETED BY OTHERS

4.12.1 Site Supervision

SCL, or its designee, will be available on the site at least once per day to review progress and provide feedback to the contractor. SCL representatives will also be available upon request to visit the site at any other time.

4.12.2 Quality Assurance

SCL, or its designee, may take independent measurements and inspect materials at its discretion, and keep a field logbook to document the progress and completion of the work. Deviations from the work and/or material specifications will be brought to the contractor's attention for immediate rectification.

4.12.3 Soil Sampling

SCL representatives, with assistance from NRC Environmental Services, will collect confirmation soil samples in the excavated areas consistent with the confirmation sampling and analysis plan provided in Appendix C. The contractor will coordinate work to accommodate this activity.

4.13 HEALTH AND SAFETY

The contractor will be responsible for developing, implementing, and complying with its own health and safety plan for the duration of the project. Only 40-hour HAZWOPER trained personnel will be permitted to enter the project exclusion zone.

4.14 SUBMITTALS

The contractor will provide the following submittals for SCL review and approval according to the schedule below:

- Prior to initiating the work
  - Project schedule
  - Proof of 40-hour HAZWOPER training for all designated workers
  - List of powered equipment and machinery to be used for the work
  - List of subcontractors
  - List of vendors/material suppliers
  - Product cut-sheet for geotextile material
  - Product cut-sheet for silt fence material
  - Product cut-sheet for chain link fence materials
  - Product information for topsoil and hydroseed mix
  - Trench backfill and drain rock material gradation test results
  - Certification verifying clean backfill material sources
  - Proposed landfill and landfill's certifications for acceptance of PCB-contaminated materials
- Within 7 days of completion of demobilization
  - Copies of signed manifests for transportation of soil
  - Contractor's daily log sheets
  - Contractor's record survey
- All other submittals, as may be required under contractor's contract with SCL

Work is to be completed during daylight between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday. No work on weekends is allowed without prior approval of SCL.

5 CONFIRMATION SAMPLING

Confirmation sampling will be conducted and, for PCBs, will conform to 40 C.F.R § 761.61(a)(6). Samples will be collected and analyzed for PCB Aroclors from below where soils with total PCB concentrations of 1 mg/kg or greater are removed. Samples will be collected and analyzed for gasoline-, diesel-, and oil-range hydrocarbons from all areas below where soils with gasoline-range hydrocarbon concentrations equal to or greater than 100 mg/kg or diesel and oil-range hydrocarbon concentrations greater than or equal to 2,000 mg/kg are removed. Cleanup will be considered complete when verification sampling results indicate that soils left in-place contain:

- Total PCB concentrations less than 1 mg/kg[9]
- Gasoline-range hydrocarbons less than 100 mg/kg

If analytical results from confirmation sampling indicate soils are left in-place with concentrations greater than specified above, additional excavation will occur. If additional excavation needs to occur due to the presence of PCBs, the additional excavation will be conducted in accordance with 40 CFR § 761.61(a)(6)(ii)(B).

Confirmation samples will be collected from the excavation bottom and sidewalls, except in the areas where sheet piling will be used. Where sheet piling is used, confirmation samples will be collected only from the bottom of the excavation. Appendix C provides the sampling and analysis plan for conducting confirmation sampling.

[9] In the areas with groundwater containing PCBs, soil removal is anticipated, based on existing data, to extend beyond soils with 1mg/kg total PCB concentrations. However, soil removal will be considered complete when all soils containing total PCB concentrations of 1 mg/kg or greater have been removed.

6 HEALTH AND SAFETY

The interim action will be conducted according to WAC 173-340-810, the Occupational Safety and Health Act of 1970 (29 U.S.C. Sec. 651 et seq.), the Washington Industrial Safety and Health Action (Chapter 49.17 Revised Code of Washington [RCW]), and relevant regulations. A Health and Safety Plan (HASP) is provided in Appendix D. This HASP will be accompanied by a contractor-specific HASP prior to commencement of the interim action.

7 REPORTING

After the completion of the excavation activities, an interim action completion report will be prepared documenting the implementation of this work plan. The completion report will address the following items:

- Description of excavation activities and observations
- Date and time excavation activities were completed
- Final excavation locations, depth of excavation, and amount of soil removed
- Tables and figures summarizing confirmation sampling results
- Laboratory data reports
- Waste disposal manifest.

8 SCHEDULE

The proposed schedule for the interim action is shown in Figure 8-1. The interim action is anticipated to be conducted in late September through early October 2010 following regulatory approval, and receipt of required permits, including EPA review/approval of the TSCA portion of this work plan for cleanup of PCB remediation waste and Ecology approval of this work plan as an interim action under the Agreed Order. Excavation activities are anticipated to require approximately 1 month to complete. All confirmatory samples will be submitted to the laboratory on a requested 48-hour turnaround to expedite the excavation process, and minimize the amount of time excavations are required to be kept open. The interim action completion report will be submitted to Ecology 45 days after the receipt of validated confirmation sample data.

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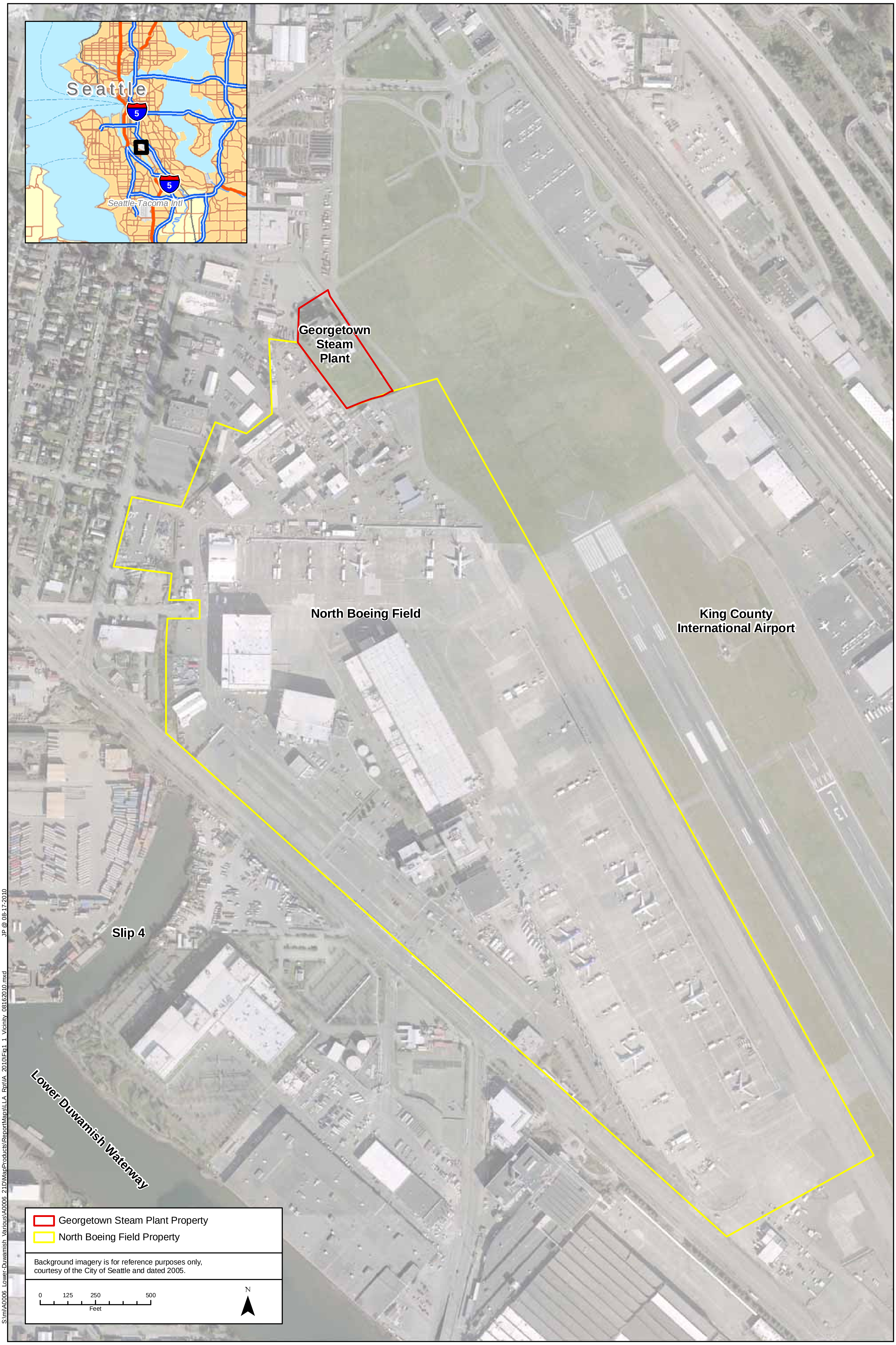
FIGURES



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DRAFT **Figure 1-1.** Georgetown Steam Plant Vicinity Map

Georgetown Steam Plant Site

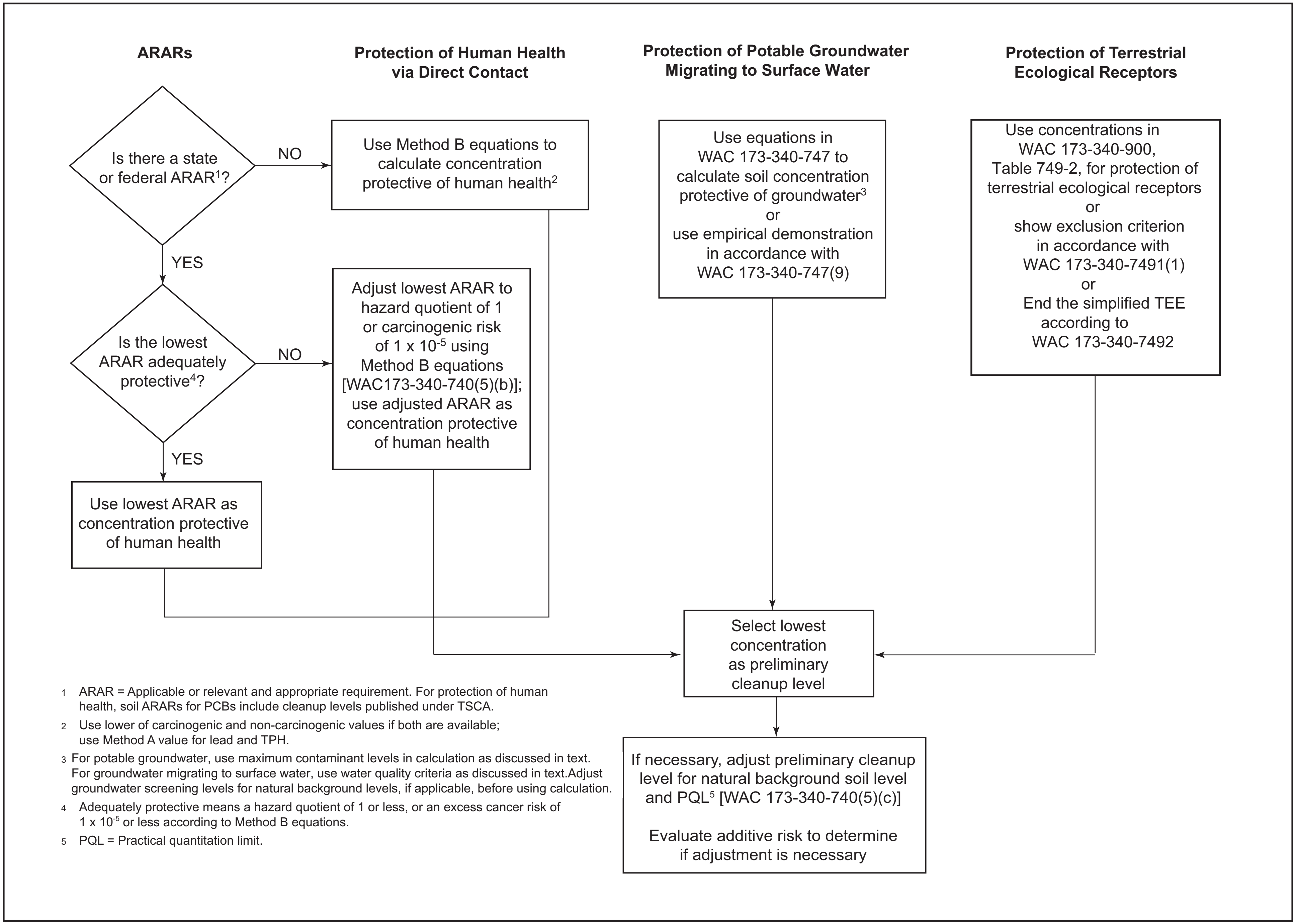
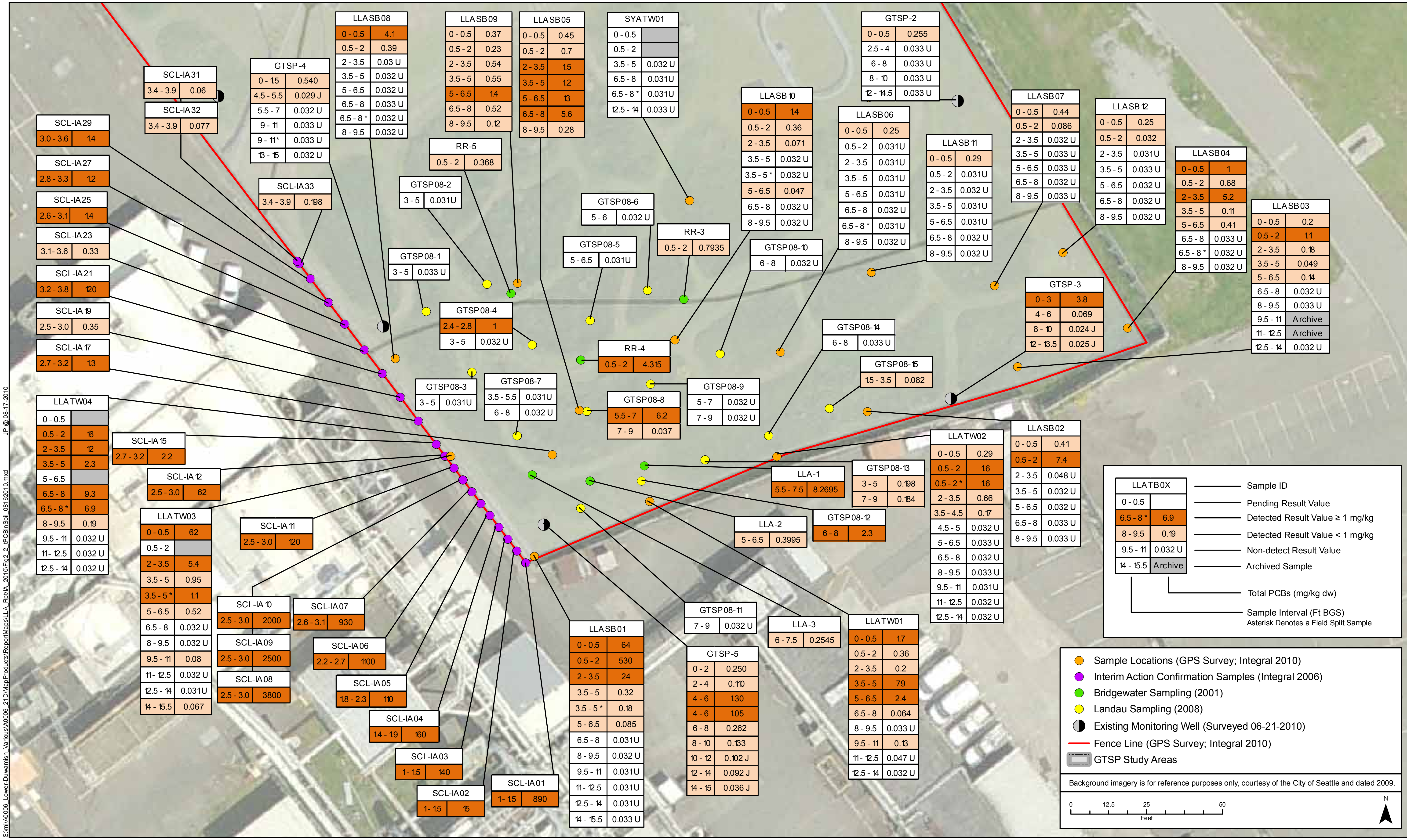


Figure 2-1. MTCA Method B Soil Cleanup Level Development



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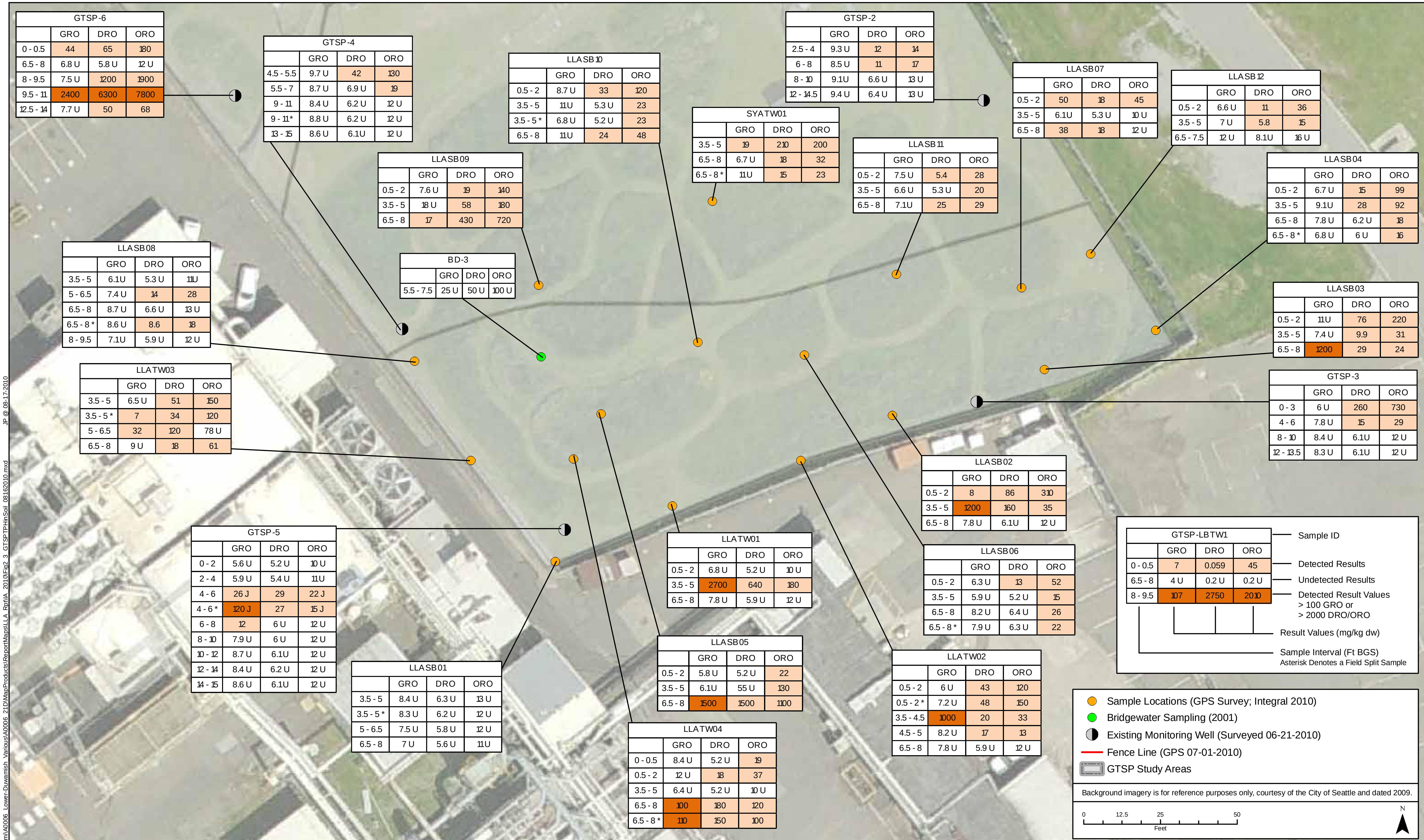
Unvalidated Data

Figure 2-2. Total PCBs in Soil Data Used to Define Removal Area Boundary

Georgetown Steam Plant Site



GTSP-6

	GRO	DRO	ORO
0 - 0.5	44	65	180
6.5 - 8	6.8 U	5.8 U	12 U
8 - 9.5	7.5 U	1200	1900
9.5 - 11	2400	6300	7800
12.5 - 14	7.7 U	50	68

GTSP-4

	GRO	DRO	ORO
4.5 - 5.5	9.7 U	42	130
5.5 - 7	8.7 U	6.9 U	19
9 - 11	8.4 U	6.2 U	12 U
9 - 11*	8.8 U	6.2 U	12 U
13 - 15	8.6 U	6.1 U	12 U

LLASB10

	GRO	DRO	ORO
0.5 - 2	8.7 U	33	120
3.5 - 5	11 U	5.3 U	23
3.5 - 5*	6.8 U	5.2 U	23
6.5 - 8	11 U	24	48

GTSP-2

	GRO	DRO	ORO
2.5 - 4	9.3 U	12	14
6 - 8	8.5 U	11	17
8 - 10	9.1 U	6.6 U	13 U
12 - 14.5	9.4 U	6.4 U	13 U

SYATW01

	GRO	DRO	ORO
3.5 - 5	19	210	200
6.5 - 8	6.7 U	18	32
6.5 - 8*	11 U	15	23

LLASB07

	GRO	DRO	ORO
0.5 - 2	50	18	45
3.5 - 5	6.1 U	5.3 U	10 U
6.5 - 8	38	18	12 U

LLASB12

	GRO	DRO	ORO
0.5 - 2	6.6 U	11	36
3.5 - 5	7 U	5.8	15
6.5 - 7.5	12 U	8.1 U	16 U

LLASB11

	GRO	DRO	ORO
0.5 - 2	7.5 U	5.4	28
3.5 - 5	6.6 U	5.3 U	20
6.5 - 8	7.1 U	25	29

LLASB09

	GRO	DRO	ORO
0.5 - 2	7.6 U	19	140
3.5 - 5	18 U	58	180
6.5 - 8	17	430	720

LLASB04

	GRO	DRO	ORO
0.5 - 2	6.7 U	15	99
3.5 - 5	9.1 U	28	92
6.5 - 8	7.8 U	6.2 U	18
6.5 - 8*	6.8 U	6 U	16

LLASB08

	GRO	DRO	ORO
3.5 - 5	6.1 U	5.3 U	11 U
5 - 6.5	7.4 U	14	28
6.5 - 8	8.7 U	6.6 U	13 U
6.5 - 8*	8.6 U	8.6	18
8 - 9.5	7.1 U	5.9 U	12 U

BD-3

	GRO	DRO	ORO
5.5 - 7.5	25 U	50 U	100 U

LLASB03

	GRO	DRO	ORO
0.5 - 2	11 U	76	220
3.5 - 5	7.4 U	9.9	31
6.5 - 8	1200	29	24

LLATW03

	GRO	DRO	ORO
3.5 - 5	6.5 U	51	150
3.5 - 5*	7	34	120
5 - 6.5	32	120	78 U
6.5 - 8	9 U	18	61

GTSP-3

	GRO	DRO	ORO
0 - 3	6 U	260	730
4 - 6	7.8 U	15	29
8 - 10	8.4 U	6.1 U	12 U
12 - 13.5	8.3 U	6.1 U	12 U

LLASB02

	GRO	DRO	ORO
0.5 - 2	8	86	310
3.5 - 5	1200	160	35
6.5 - 8	7.8 U	6.1 U	12 U

GTSP-5

	GRO	DRO	ORO
0 - 2	5.6 U	5.2 U	10 U
2 - 4	5.9 U	5.4 U	11 U
4 - 6	26 J	29	22 J
4 - 6*	120 J	27	15 J
6 - 8	12	6 U	12 U
8 - 10	7.9 U	6 U	12 U
10 - 12	8.7 U	6.1 U	12 U
12 - 14	8.4 U	6.2 U	12 U
14 - 15	8.6 U	6.1 U	12 U

LLATW01

	GRO	DRO	ORO
0.5 - 2	6.8 U	5.2 U	10 U
3.5 - 5	2700	640	180
6.5 - 8	7.8 U	5.9 U	12 U

LLASB06

	GRO	DRO	ORO
0.5 - 2	6.3 U	13	52
3.5 - 5	5.9 U	5.2 U	15
6.5 - 8	8.2 U	6.4 U	26
6.5 - 8*	7.9 U	6.3 U	22

LLASB05

	GRO	DRO	ORO
0.5 - 2	5.8 U	5.2 U	22
3.5 - 5	6.1 U	55 U	130
6.5 - 8	1500	1500	1100

LLASB01

	GRO	DRO	ORO
3.5 - 5	8.4 U	6.3 U	13 U
3.5 - 5*	8.3 U	6.2 U	12 U
5 - 6.5	7.5 U	5.8 U	12 U
6.5 - 8	7 U	5.6 U	11 U

LLATW02

	GRO	DRO	ORO
0.5 - 2	6 U	43	120
0.5 - 2*	7.2 U	48	150
3.5 - 4.5	1000	20	33
4.5 - 5	8.2 U	17	13
6.5 - 8	7.8 U	5.9 U	12 U

LLATW04

	GRO	DRO	ORO
0 - 0.5	8.4 U	5.2 U	19
0.5 - 2	12 U	18	37
3.5 - 5	6.4 U	5.2 U	10 U
6.5 - 8	100	180	120
6.5 - 8*	110	150	100

GTSP-LBTW1

	GRO	DRO	ORO
0 - 0.5	7	0.059	45
6.5 - 8	4 U	0.2 U	0.2 U
8 - 9.5	107	2750	2010

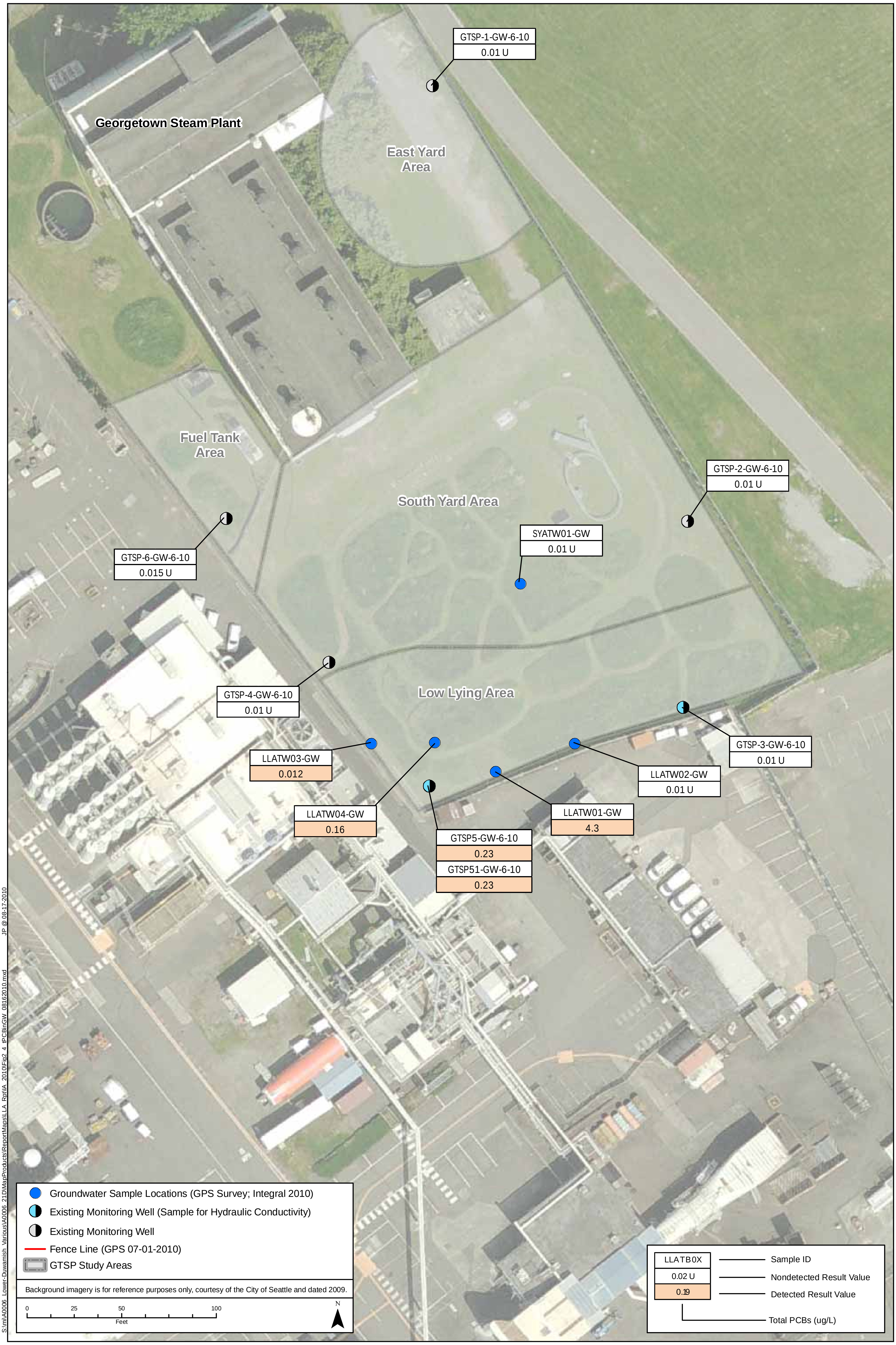
S:\mi\A0006_Lower-Duwamish_Various\A0006_21D\MapProducts\ReportMaps\LLA_RptIA_2010\Fig2_3_GTSPTPHinSoil_08162010.mxd JP @ 08-17-2010

integral consulting inc.

DRAFT
Unvalidated data

Figure 2-3. TPH in Soil Data Used To Define Removal Area Boundary

Georgetown Steam Plant Site

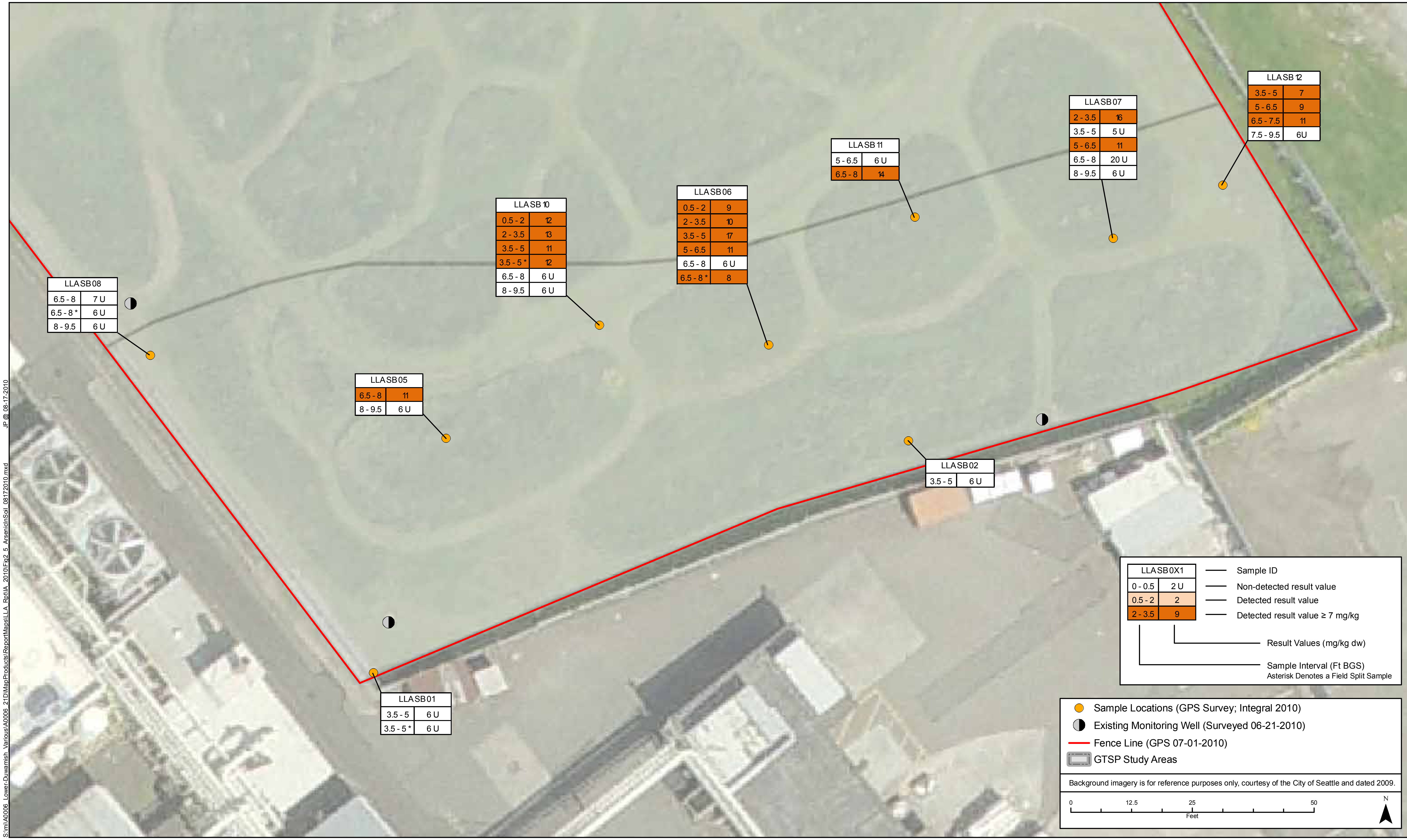


integral consulting inc.

DRAFT
Unvalidated Data

Figure 2-4. Total PCBs in Groundwater Data Used to Define Removal Area Boundary

Georgetown Steam Plant Site



S:\mi\A0006 Lower-Duwamish Various\A0006 21D\MapProducts\ReportMaps\LLA RptIA 2010\Fig2 5 ArsenicInSoil 08172010.mxd JP @ 08-17-2010

integral consulting inc.

DRAFT
Unvalidated Data

Figure 2-5. Arsenic in Soil Data

Georgetown Steam Plant Site

S:\m\A0006_Lower-Duwamish_Various\A0006_21D\MapProducts\ReportMaps\LLA_Rpt\Fig_2_tPCBinSoil_08162010.mxd JP @ 08-16-2010

integral consulting inc.

0 20 40 Feet N

July 2010 Grounwater Sample Location

Total PCB >0.1 ug/L

DRAFT
Unvalidated Data

Figure 2-6. Results of Groundwater Kriging Analysis

Georgetown Steam Plant Site

S:\ml\A0006 Lower-Duwamish Various\A0006 21D\MapProducts\ReportMaps\LLA Rpt\Fig 2 tPCBinSoil 08162010.mxd JP @ 08-16-2010

integral consulting inc.

N

0 25 50
Feet

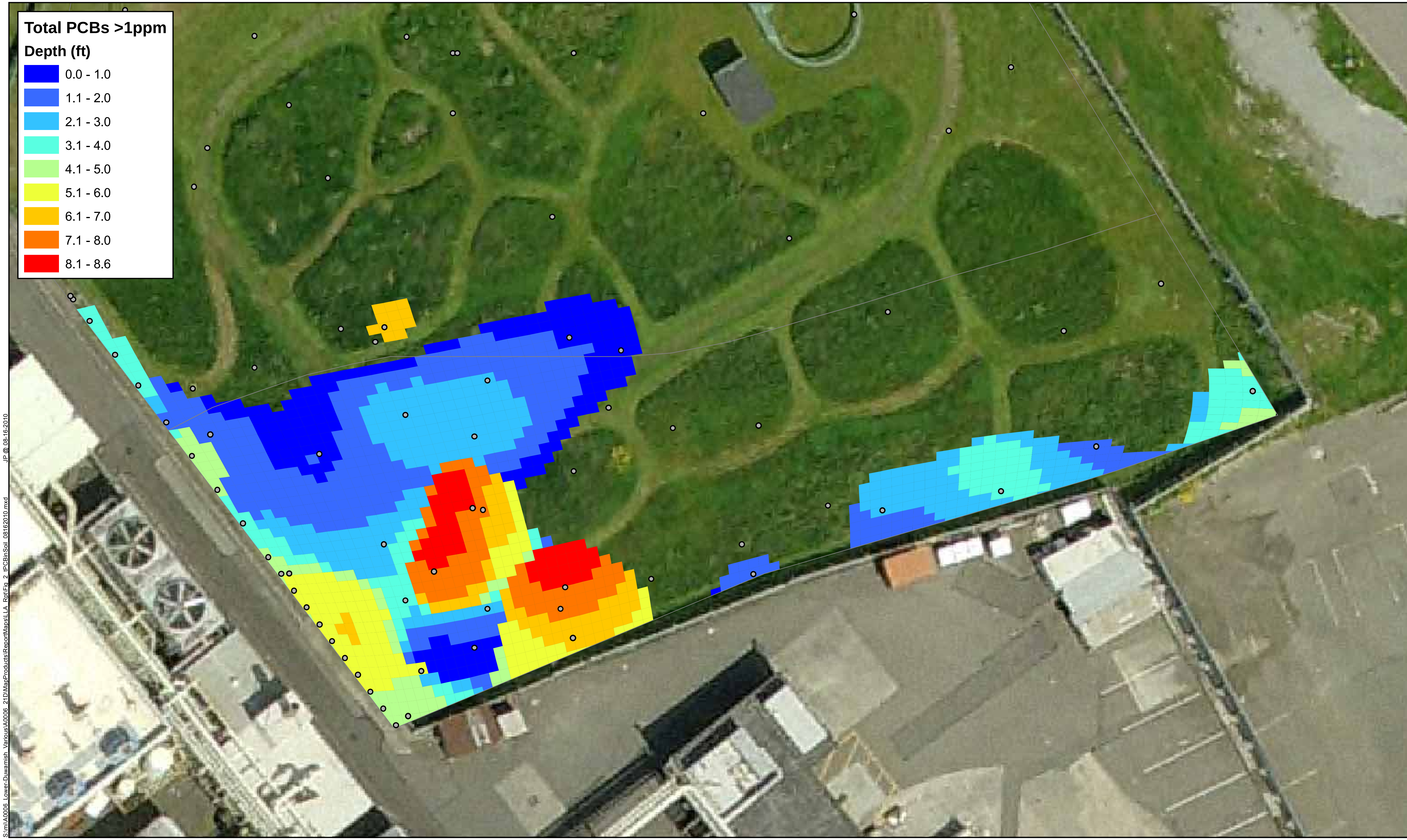
Soil Sample Location

Study Areas

DRAFT
Unvalidated Data

Figure 2-7. Areal Extent and Depth of Soils with Total PCBs ≥ 50 mg/kg

Georgetown Steam Plant Site



S:\mi\A0006_Lower-Duwamish_Various\A0006_21D\MapProducts\ReportMaps\LLA_RptFig_2_tPCBinSoil_08162010.mxd JP @ 08-16-2010

integral consulting inc.

N

0 25 50
Feet

Soil Sample Location

Study Areas

DRAFT
Unvalidated Data

Figure 2-8. Areal Extent and Depth of Soils with Total PCBs ≥ 1 mg/kg

Georgetown Steam Plant Site

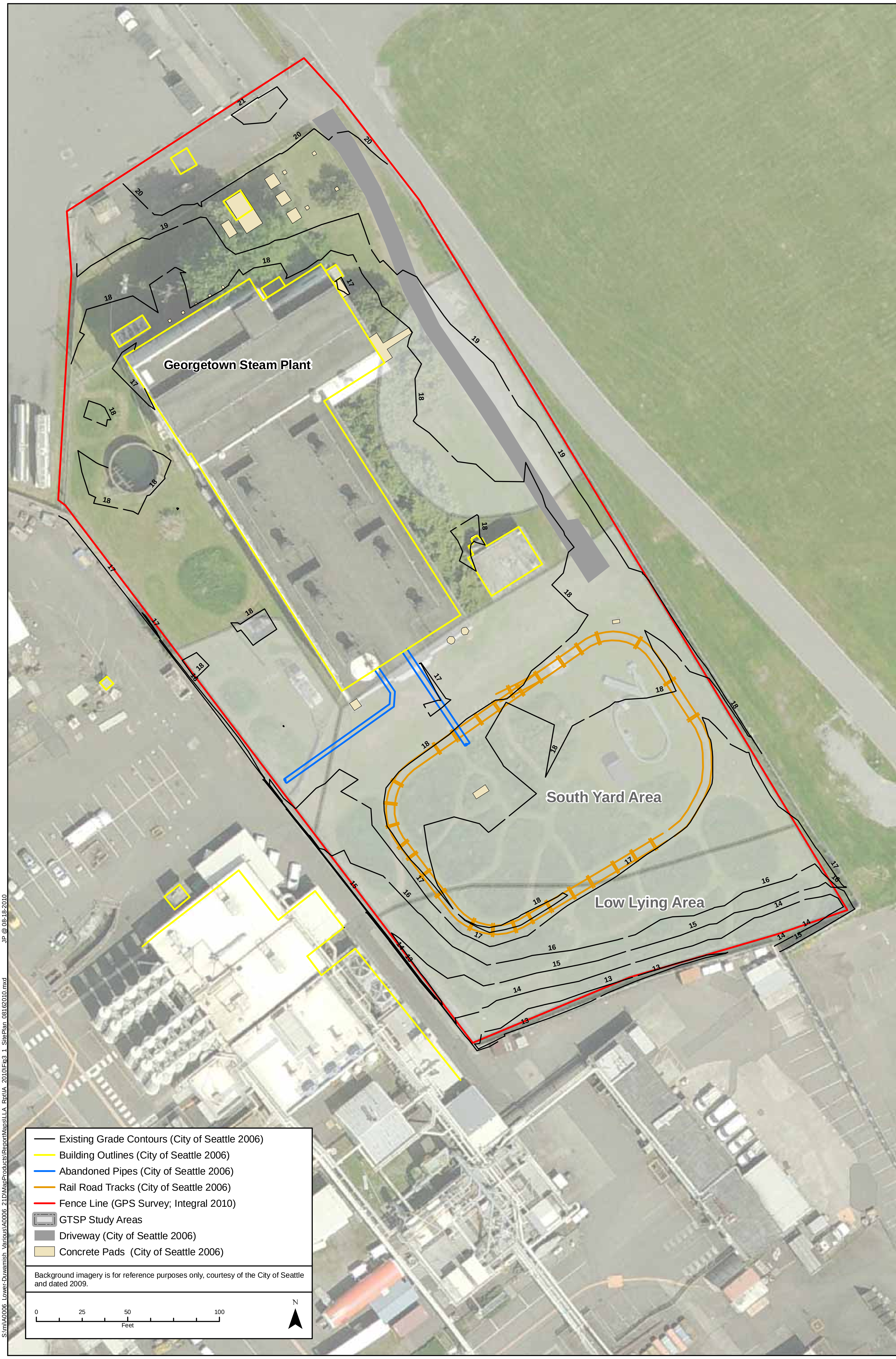
S:\mi\A0006_Lower-Duwamish_Various\A0006_21D\MapProducts\Report\Maps\LLA_Rpt\Fig_2_tPCBinSoil_08162010.mxd
JP @ 08-16-2010

integral consulting inc.

DRAFT
Unvalidated Data

Figure 2-9. Areal Extent and Depth of Soils with GRO ≥ 100 mg/kg

Georgetown Steam Plant Site



JP @ 08-18-2010

integral consulting inc.

DRAFT **Figure 3-1.** Site Plan

Georgetown Steam Plant Site

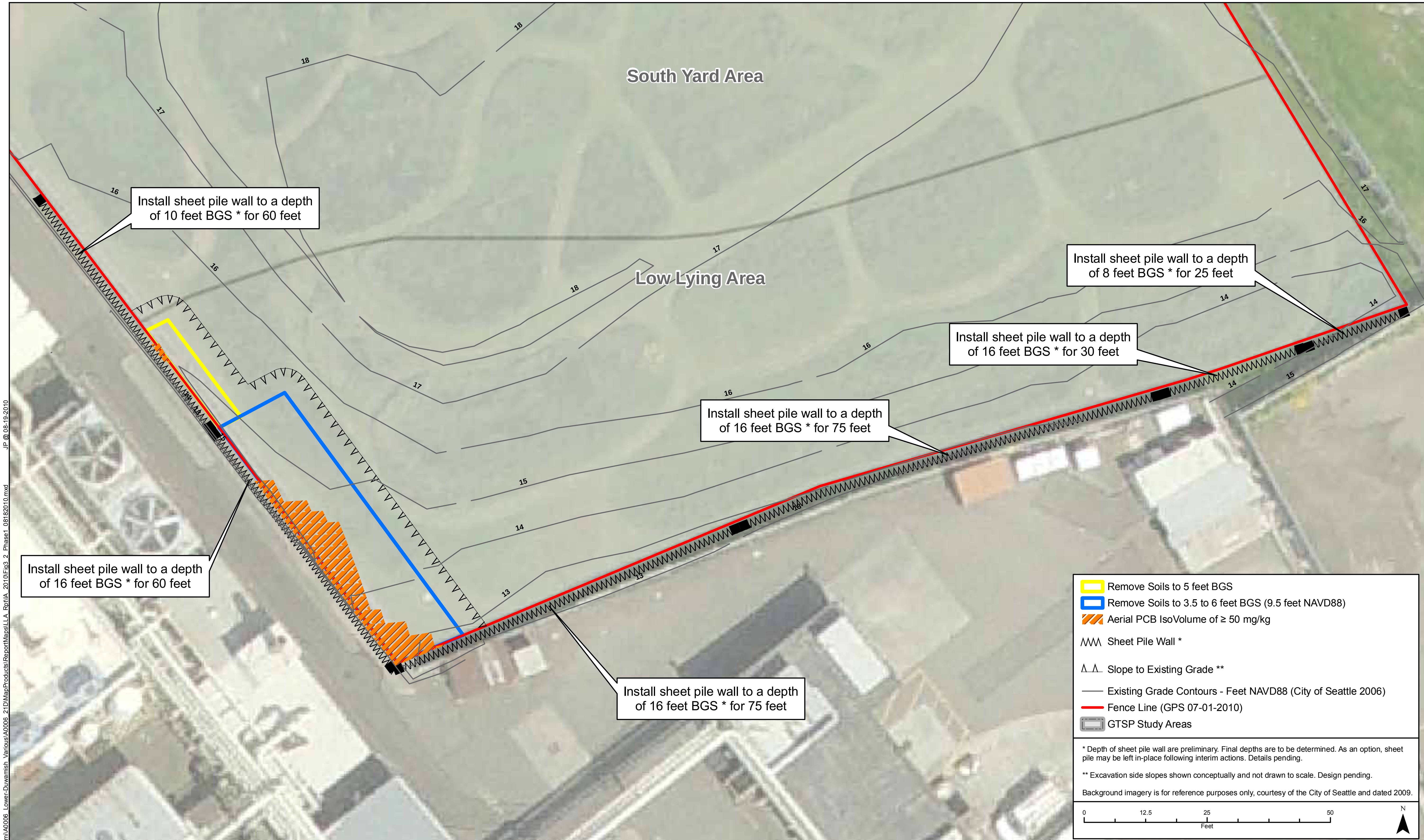


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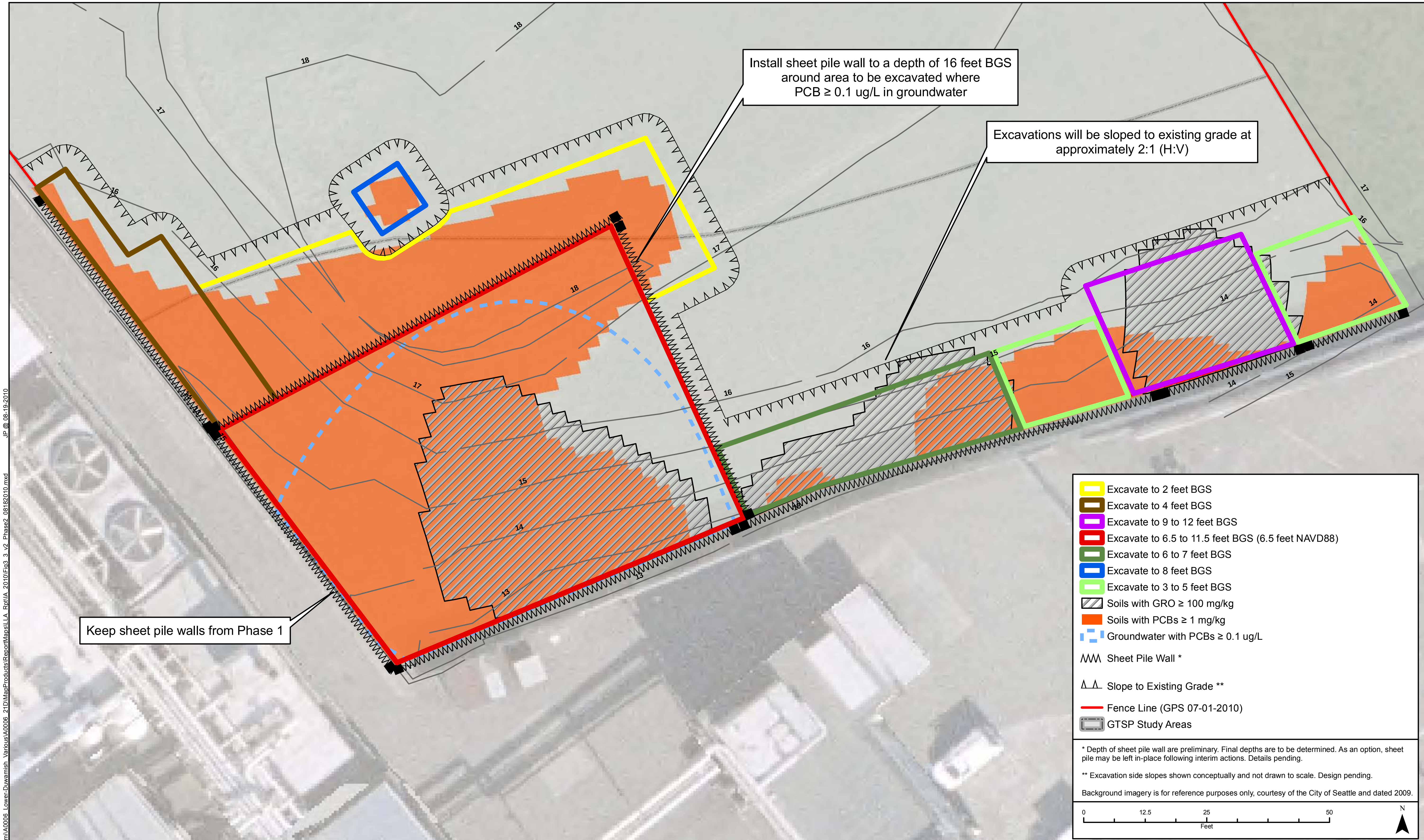
Figure 3-2. Phase I - Install Sheet Pile and Remove Soils with Total PCBs ≥ 50 mg/kg

Georgetown Steam Plant Site



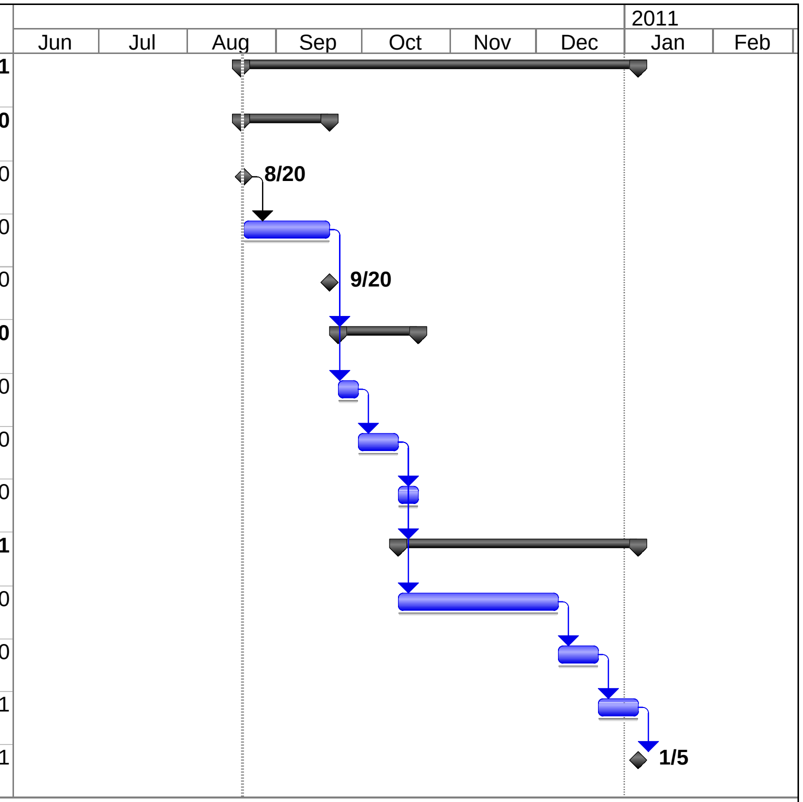
S:\ml\A0006_Lower-Duwamish_Various\A0006_21D\MapProducts\ReportMaps\LLA_RptIA_2010\Fig3_3_v2_Phase2_08182010.mxd JP @ 08-19-2010

integral consulting inc.

DRAFT **Figure 3-3.** Phase 2 - Remove Soils in GW Area to 6.5 ft NAVD88, with Total PCBs ≥ 1 mg/kg, and Soils with GRO ≥ 100 mg/kg

Georgetown Steam Plant Site

ID	Task Name	Duration	Start	Finish
1	**Low-Lying Area Interim Action**	**99 days**	**Fri 8/20/10**	**Wed 1/5/11**
2	**LLA Interim Action Work Plan**	**21 days**	**Fri 8/20/10**	**Mon 9/20/10**
3	Submit IAWP to Ecology and EPA	1 day	Fri 8/20/10	Fri 8/20/10
4	EPA 30-day TSCA Review	30 edays	Fri 8/20/10	Sun 9/19/10
5	Complete final Scope of Work	0 days	Mon 9/20/10	Mon 9/20/10
6	**LLA Interim Remedial Action Construction**	**20 days**	**Thu 9/23/10**	**Wed 10/20/10**
7	Mobilization	5 days	Thu 9/23/10	Wed 9/29/10
8	Complete Excavation	10 days	Thu 9/30/10	Wed 10/13/10
9	Demobilization	5 days	Thu 10/14/10	Wed 10/20/10
10	**LLA Interim Action Completion Report**	**60 days**	**Thu 10/14/10**	**Wed 1/5/11**
11	Prepare draft	40 days	Thu 10/14/10	Wed 12/8/10
12	City Review	10 days	Thu 12/9/10	Wed 12/22/10
13	Revise	10 days	Thu 12/23/10	Wed 1/5/11
14	Submit to Ecology	0 days	Wed 1/5/11	Wed 1/5/11



Task Milestone Summary

Figure 8-1. Georgetown Steam Plant Interim Action Schedule

TABLES

Table 3-3. Potential Location-Specific ARARs

Location/Activity	Requirement	Citation	Comments
Evaluation of Environmental Impacts	Evaluation of project environmental impacts and definition of appropriate measures for impact mitigation	State Environmental Policy Act (SEPA; WAC 197-11) National Environmental Policy Act (NEPA)	SEPA/NEPA checklist will be prepared in conjunction with final scope of work to evaluate SEPA/NEPA substantive requirements.
Noise Control	Maximum noise levels	Noise Control Act of 1974 (RCW 70.107; WAC 173-60)	Potentially relevant depending on equipment and transportation routes.
Grading Activities	City of Seattle requirements for grading activities	Seattle Municipal Code (SMC; Title 22.804)	To be considered to manage stormwater drainage post-construction.
Historic Sites or Structures	Alternatives must be evaluated to avoid, minimize, or mitigate the impact on historic sites or structures	National Historic Preservation Act (36 CFR Parts 60, 63, and 800)	Interim action is to be conducted at National Historic Site, construction will be conducted to minimize impact at site.

Table 3-1. Potential Chemical Specific ARARs

Medium/Requirement	Standard/Criteria	Prerequisite	Citation	Comments
Model Toxics Control Act (WAC 173-340)	Requirements for establishing numeric or risk-based standards and selecting cleanup actions	State hazardous waste site and any contaminated site in Washing being cleaned up under Superfund	WAC 173-340, Sections 720, 740 and 745	Applicable for soils to be removed and potentially applicable to groundwater as necessary to protect surface water.
Toxic Substances Control Act (TSCA; 40 CFR 761)	Because PCBs are a COC at this site, regulations pertaining to PCB remediation waste apply.	Soils greater than 50 mg/kg present.	40 CFR 761.61	Cleanup levels may be determined based on expected exposure and proximity to sensitive environments.
Federal Water Pollution Control Act/Clean Water Act (CWA; 33 USCA 125-1376; 40 CFR 100-149)	Ambient water quality criteria for the protection of aquatic organisms and human health	Management of stormwater discharge to surface water	40 CFR 131	Narrative and quantitative limitations for surface water protection. Removal action will include measures to be taken to comply with surface water standards during implementation.
Washington State Water Quality Standards for Surface Waters (WAC 173-201a)	State water quality standards; conventional water quality parameters and toxic criteria	Management of stormwater discharge to surface water	WAC 173-201a-040	Narrative and quantitative limitations for surface water protection. Removal action will include measures to be taken to comply with surface water standards during implementation.

Table 3-2. Potential Action-Specific ARARs

Actions	Requirement	Citation	Comments
Disposal of excavated soils	Regulations pertaining to PCB remediation waste	Toxic Substances Control Action (TSCA; 40 CFR 761.61)	Disposal of soil with total PCB concentrations greater than 50 mg/kg will need to be managed in accordance with TSCA regulations.
Disposal of excavated soils	State criteria for dangerous waste (which are broader than federal hazardous waste criteria)	WAC 173-303	State and federal laws prohibit land disposal of certain hazardous or dangerous wastes.
Disposal of excavated soils and other construction related debris	Federal and State requirements for solid waste management	40 CFR 257 and 258 WAC 173-304 WAC 173-250	Applicable to non-hazardous waste generated during remedial activities and disposed off-site unless wastes meet recycling exemptions.
Washington State Water Quality Standards for Surface Waters (WAC 173-201a)	State water quality standards; conventional water quality parameters and toxic criteria	WAC 173-201a-040	Narrative and quantitative limitations for surface water protection. Removal action will include measures to be taken to comply with surface water standards during implementation.
Air Emissions	Regional Emission Standards - BACT to control dust	PSAPCA Regulation I	Removal action will includes measures to be taken to control dust emissions.
Air Emissions	Puget Sound Clean Air Agency Regulations controlling dust emissions	PSCAA Section 9.15 of Regulation I	Removal action will includes measures to be taken to control dust emissions.
Wastewater	Permitting & pre-treatment requirements for direct discharges into surface water	National Pollutant Discharge Elimination System (NPDES; 40 CFR 122, 125) State Discharge Permit Program (WAC 173-216, 220)	Construction stormwater requirements will be satisfied for handling of soil, including the development of a Storm Water Pollution Prevention Plan and implementation of best management practices.
Wastewater	Permitting and pre-treatment requirements for discharges to a POTW.	National Pretreatment Standards (40 CFR 403) King County Wastewater treatment requirements	Excavation dewatering water is subject to POTW permitting and pre-treatment standards.

Table 3-4. Groundwater Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Drinking Water Screening Level[a]	Surface Water Protection Screening Level[b]	Final Groundwater Screening Level[c]	See Footnote
Conventionals						
TOC	TOC	µg/L	NV	NV	NV	
TSS	TSS	µg/L	NV	NV	NV	
TDS	TDS	µg/L	500,000	NV	500,000	
Conductivity	E1640291	µmhos/cm	700	NV	700	
Alkalinity	ALK	µg/L	NV	20,000	20,000	
Chloride	16887006	µg/L	250,000	230,000	230,000	
Sulfate	14808798	µg/L	250,000	NV	250,000	
Hardness	HARD	µg/L	NV	NV	NV	
Metals						
Arsenic	7440382	µg/L	0.58	0.14	0.14	
Cadmium	7440439	µg/L	5	0.25	0.25	
Chromium	7440473	µg/L	100	10	10	
Copper	7440508	µg/L	592	2.4	2.4	
Lead	7439921	µg/L	15	2.5	2.5	
Nickel	7440020	µg/L	100	8.2	8.2	
Tin	7440315	µg/L	9,600	NV	9,600	
Zinc	7440666	µg/L	4,800	81	81	
Mercury	7439976	µg/L	2	0.012	0.012	
Chromium(VI)	18540299	µg/L	48	10	10	
Petroleum Hydrocarbons						
Gasoline-range hydrocarbons (toluene - naphthalene)	GRH	µg/L	1,000	NV	1,000	d,e
Diesel-range hydrocarbons (nC12-nC24)	DRH	µg/L	500	NV	500	e
Oil-range hydrocarbons (nC24-nC38)	HORH	µg/L	500	NV	500	e
Volatile Petroleum Hydrocarbons						
C5 – C6 Aliphatics	A	µg/L	NV	NV	NV	
C6 – C8 Aliphatics	B	µg/L	NV	NV	NV	
C8 – C10 Aliphatics	C	µg/L	NV	NV	NV	
C10 – C12 Aliphatics	D	µg/L	NV	NV	NV	
C8 – C10 Aromatics	H	µg/L	NV	NV	NV	
C10 – C12 Aromatics	I	µg/L	NV	NV	NV	
C12 – C13 Aromatics	J	µg/L	NV	NV	NV	
Extractable Petroleum Hydrocarbons						
C8 – C10 Aliphatics	C	µg/L	NV	NV	NV	
C10 – C12 Aliphatics	D	µg/L	NV	NV	NV	
C12 – C16 Aliphatics	E	µg/L	NV	NV	NV	
C16 – C21 Aliphatics	F	µg/L	NV	NV	NV	
C21 – C34 Aliphatics	G	µg/L	NV	NV	NV	

Table 3-4. Groundwater Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Drinking Water Screening Level[a]	Surface Water Protection Screening Level[b]	Final Groundwater Screening Level[c]	See Footnote
C8 – C10 Aromatics	H	µg/L	NV	NV	NV	
C10 – C12 Aromatics	I	µg/L	NV	NV	NV	
C12 – C16 Aromatics	K	µg/L	NV	NV	NV	
C16 – C21 Aromatics	L	µg/L	NV	NV	NV	
C21 – C34 Aromatics	M	µg/L	NV	NV	NV	
Organochlorine Pesticides						
4,4'-DDD	72548	µg/L	0.36	0.00031	0.00031	
4,4'-DDE	72559	µg/L	0.26	0.00022	0.00022	
4,4'-DDT	50293	µg/L	0.26	0.00022	0.00022	
Aldrin	309002	µg/L	0.0026	0.00005	0.00005	
alpha-BHC	319846	µg/L	0.014	0.0049	0.0049	
beta-BHC	319857	µg/L	0.049	0.017	0.017	
delta-BHC	319868	µg/L	0.2	0.063	0.063	f
gamma-BHC (Lindane)	58899	µg/L	0.2	0.063	0.063	
alpha-Chlordane	5103719	µg/L	2	NV	2	g
gamma-Chlordane	5566347	µg/L	2	NV	2	g
trans-Chlordane	5103742	ug/L	0.002	0.00057	0.00057	
Dieldrin	60571	µg/L	0.0055	0.000054	0.000054	
Endosulfan I	959988	µg/L	NV	0.0087	0.0087	h
Endosulfan II	33213659	µg/L	NV	0.0087	0.0087	h
Endosulfan sulfate	1031078	µg/L	NV	2	2	
Endrin	72208	µg/L	2	0.0023	0.0023	
Endrin aldehyde	7421934	µg/L	NV	0.3	0.3	
Endrin ketone	53494705	µg/L	NV	NV	NV	
Heptachlor	76448	µg/L	0.19	0.000079	0.000079	
Heptachlor epoxide	1024573	µg/L	0.048	0.000039	0.000039	
Hexachlorobenzene	118741	µg/L	0.55	0.00029	0.00029	
Hexachlorobutadiene	87683	µg/L	0.56	18	0.56	
Methoxychlor	72435	µg/L	40	0.03	0.03	
Toxaphene	8001352	µg/L	0.80	0.0002	0.0002	
PCB Aroclors						
Aroclor 1016	12674112	µg/L	0.5	0.000064	0.000064	
Aroclor 1221	11104282	µg/L	0.5	0.000064	0.000064	
Aroclor 1232	11141165	µg/L	0.5	0.000064	0.000064	
Aroclor 1242	53469219	µg/L	0.5	0.000064	0.000064	
Aroclor 1248	12672296	µg/L	0.5	0.000064	0.000064	
Aroclor 1254	11097691	µg/L	0.32	0.000064	0.000064	
Aroclor 1260	11096825	µg/L	0.5	0.000064	0.000064	

Table 3-4. Groundwater Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Drinking Water Screening Level[a]	Surface Water Protection Screening Level[b]	Final Groundwater Screening Level[c]	See Footnote
Aroclor 1262	37324235	µg/L	0.5	0.000064	0.000064	
Aroclor 1268	11100144	µg/L	0.5	0.000064	0.000064	
PCBs (total)	1336363	µg/L	0.5	0.000064	0.000064	
Semivolatile Organic Compounds						
1-Methylnaphthalene	90120	µg/L	NV	NV	NV	
Phenol	108952	µg/L	4,800	860,000	4,800	
Bis-(2-chloroethyl) ether	111444	µg/L	0.040	0.53	0.040	
2-Chlorophenol	95578	µg/L	40	97	40	
1,3-Dichlorobenzene	541731	µg/L	NV	960	960	
1,4-Dichlorobenzene	106467	µg/L	18	49	18	
Benzyl Alcohol	100516	µg/L	2,400	NV	2,400	
1,2-Dichlorobenzene	95501	µg/L	600	1,300	600	
2-Methylphenol	95487	µg/L	400	NV	400	
2,2'-oxybis(1-chloropropane)	108601	µg/L	0.63	34	0.63	
4-Methylphenol	106445	µg/L	40	NV	40	
N-Nitroso-di-n-propylamine	621647	µg/L	NV	0.51	0.51	
Hexachloroethane	67721	µg/L	3.1	3.3	3.1	
Nitrobenzene	98953	µg/L	4	449	4	
Isophorone	78591	µg/L	46	600	46	
2-Nitrophenol	88755	µg/L	NV	NV	NV	
2,4-Dimethylphenol	105679	µg/L	160	553	160	
Bis-(2-chloroethoxy) methane	111911	µg/L	NV	4.4	4.4	
Benzoic Acid	65850	µg/L	64,000	NV	64,000	
2,4-Dichlorophenol	120832	µg/L	24	191	24	
1,2,4-Trichlorobenzene	120821	µg/L	70	70	70	
Naphthalene	91203	µg/L	160	765	160	
4-Chloroaniline	106478	µg/L	32	NV	32	
2-Chloronaphthalene	91587	µg/L	640	22	22	
Hexachlorobutadiene	87683	µg/L	0.56	18	0.56	
4-Chloro-3-methylphenol	59507	µg/L	NV	NV	NV	
2-Methylnaphthalene	91576	µg/L	32	NV	32	
Hexachlorocyclopentadiene	77474	µg/L	48	525	48	
2,4,6-Trichlorophenol	88062	µg/L	4.0	2.4	2.4	
2,4,5-Trichlorophenol	95954	µg/L	800	3,600	800	
2-Nitroaniline	88744	µg/L	NV	NV	NV	
Dimethylphthalate	131113	µg/L	16,000	1,600	1,600	
Acenaphthylene	208968	µg/L	NV	NV	NV	
2,6-Dinitrotoluene	606202	µg/L	16	8.9	8.9	

Table 3-4. Groundwater Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Drinking Water Screening Level[a]	Surface Water Protection Screening Level[b]	Final Groundwater Screening Level[c]	See Footnote
3-Nitroaniline	99092	µg/L	NV	NV	NV	
Acenaphthene	83329	µg/L	960	643	643	
2,4-Dinitrophenol	51285	µg/L	32	3457	32	
Dibenzofuran	132649	µg/L	32	NV	32	
4-Nitrophenol	100027	µg/L	NV	NV	NV	
2,4-Dinitrotoluene	121142	µg/L	32	3.4	3.4	
Fluorene	86737	µg/L	640	3,457	640	
Diethylphthlalate	84662	µg/L	12,800	28,412	12,800	
4-Chlorophenyl-phenyl ether	7005723	µg/L	NV	NV	NV	
4-Nitroaniline	100016	µg/L	NV	NV	NV	
4,6-Dinitro-2-Methylphenol	534521	µg/L	NV	280	280	
N-Nitrosodiphenylamine	86306	µg/L	NV	6	6	
4-Bromophenyl-phenyl ether	101553	µg/L	NV	NV	NV	
Hexachlorobenzene	118741	µg/L	0.55	0.00029	0.00029	
Pentachlorophenol	87865	µg/L	1	3	1	
Phenanthrene	85018	µg/L	NV	NV	NV	
Anthracene	120127	µg/L	4,800	25,926	4,800	
Carbazole	86748	µg/L	4.4	NV	4.4	
Di-n-butylphthalate	84742	µg/L	1,600	11	11	
Fluoranthene	206440	µg/L	640	90	90	
Pyrene	129000	µg/L	480	8.2	8.2	
Butylbenzylphthalate	85687	µg/L	3,200	470	470	
Benzo(a)anthracene	56553	µg/L	NV	0.018	0.018	
3,3'-Dichlorobenzidine	91941	µg/L	0.19	0.028	0.028	
Chrysene	218019	µg/L	NV	0.018	0.018	
bis(2-Ethylhexyl) phthalate	117817	µg/L	6	2.2	2.2	
Di-n-octylphthalate	117840	µg/L	320	200,000	320	
Benzo(b)fluoranthene	205992	µg/L	NV	0.018	0.018	
Benzo(k)fluoranthene	207089	µg/L	NV	0.018	0.018	
Benzo(a)pyrene	50328	µg/L	0.12	0.018	0.018	
Indeno(1,2,3-cd)pyrene	193395	µg/L	NV	0.018	0.018	
Dibenzo(a,h)anthracene	53703	µg/L	NV	0.018	0.018	
Benzo(g,h,i)Perylene	191242	µg/L	NV	71	71	
Polycyclic Aromatic Hydrocarbons						
Naphthalene	91203	µg/L	160	765	160	
2-Methylnaphthalene	91576	µg/L	32	NV	32	
Acenaphthylene	208968	µg/L	NV	NV	NV	
Acenaphthene	83329	µg/L	960	643	643	

Table 3-4. Groundwater Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Drinking Water Screening Level[a]	Surface Water Protection Screening Level[b]	Final Groundwater Screening Level[c]	See Footnote
Dibenzofuran	132649	µg/L	32	NV	32	
Fluorene	86737	µg/L	640	3457	640	
Phenanthrene	85018	µg/L	NV	NV	NV	
Anthracene	120127	µg/L	4,800	25,926	4,800	
Fluoranthene	206440	µg/L	640	90	90	
Pyrene	129000	µg/L	480	8.2	8.2	
Benzo(a)anthracene	56553	µg/L	NV	0.018	0.018	
Chrysene	218019	µg/L	NV	0.018	0.018	
Benzo(b)fluoranthene	205992	µg/L	NV	0.018	0.018	
Benzo(k)fluoranthene	207089	µg/L	NV	0.018	0.018	
Benzo(a)pyrene	50328	µg/L	0.12	0.018	0.018	
Indeno(1,2,3-cd)pyrene	193395	µg/L	NV	0.018	0.018	
Dibenzo(a,h)anthracene	53703	µg/L	NV	0.018	0.018	
Benzo(g,h,i)perylene	191242	µg/L	NV	71	71	
1-Methylnaphthalene	90120	µg/L	NV	NV	NV	
Skydrol™ Components						
Tributyl phosphate	126738	µg/L	9.5	NV	9.5	
Dibutyl phenyl phosphate	2528361	µg/L	NV	NV	NV	
Butyl diphenyl phosphate	2752956	µg/L	NV	NV	NV	
Triphenyl phosphate	115866	µg/L	NV	NV	NV	
Volatile Organic Compounds						
Dichlorodifluoromethane	75718	µg/L	1,600	NV	1,600	
Chloromethane	74873	µg/L	3.4	133	3.4	
Vinyl Chloride	75014	µg/L	0.29	2.4	0.29	
Bromomethane	74839	µg/L	11	968	11	
Chloroethane	75003	µg/L	15	NV	15	
Trichlorofluoromethane	75694	µg/L	2,400	NV	2,400	
Acrolein	107028	µg/L	160	3	3	
Acetone	67641	µg/L	800	NV	800	
Trifluoroethane	76131	µg/L	240,000	NV	240,000	
1,1-Dichloroethene	75354	µg/L	7	3.2	3.2	
Bromoethane	74964	µg/L	NV	NV	NV	
Iodomethane	74884	µg/L	NV	NV	NV	
Methylene Chloride	75092	µg/L	5	590	5	
Carbon Disulfide	75150	µg/L	800	NV	800	
Acrylonitrile	107131	µg/L	0.081	0.25	0.081	
Methyl-t-butyl ether (MTBE)	1634044	µg/L	24	NV	24	
trans-1,2-Dichloroethene	156605	µg/L	100	10,000	100	

Table 3-4. Groundwater Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Drinking Water Screening Level[a]	Surface Water Protection Screening Level[b]	Final Groundwater Screening Level[c]	See Footnote
Vinyl Acetate	108054	µg/L	8,000	NV	8,000	
1,1-Dichloroethane	75343	µg/L	1,600	NV	1,600	
2-Butanone	78933	µg/L	4,800	NV	4,800	
2,2-Dichloropropane	594207	µg/L	NV	NV	NV	
cis-1,2-Dichloroethene	156592	µg/L	70	NV	70	
Chloroform	67663	µg/L	7.2	470	7.2	
Bromochloromethane	74975	µg/L	NV	NV	NV	
1,1,1-Trichloroethane	71556	µg/L	200	926,000	200	
1,1-Dichloropropene	563586	µg/L	NV	NV	NV	
Carbon Tetrachloride	56235	µg/L	3.4	1.6	1.6	
1,2-Dichloroethane	107062	µg/L	4.8	37	4.8	
Benzene	71432	µg/L	5	51	5	
Trichloroethene	79016	µg/L	4.9	30	4.9	
1,2-Dichloropropane	78875	µg/L	5	15	5	
Bromodichloromethane	75274	µg/L	0.71	17	0.71	
Dibromomethane	74953	µg/L	80	NV	80	
2-Chloroethyl Vinyl Ether	110758	µg/L	NV	NV	NV	
4-Methyl-2-pentanone	108101	µg/L	640	NV	640	
cis-1,3-Dichloropropene	10061015	µg/L	NV	NV	NV	
Toluene	108883	µg/L	640	15,000	640	
trans-1,3-Dichloropropene	10061026	µg/L	NV	NV	NV	
1,1,2-Trichloroethane	79005	µg/L	5	16	5	
1,2-Dibromoethane	106934	µg/L	0.05	NV	0.05	
2-Hexanone	591786	µg/L	NV	NV	NV	
1,3-Dichloropropane	142289	µg/L	NV	NV	NV	
Tetrachloroethene	127184	µg/L	0.81	3.3	0.81	
Chlorodibromomethane	124481	µg/L	0.52	13	0.52	
Chlorobenzene	108907	µg/L	100	1,600	100	
1,1,1,2-Tetrachloroethane	630206	µg/L	1.7	0.0087	0.0087	
Ethylbenzene	100414	µg/L	700	2100	700	
m,p-Xylene	179601231	µg/L	NV	NV	NV	
o-Xylene	95476	µg/L	16,000	NV	16,000	
Styrene	100425	µg/L	15	NV	15	
Bromoform	75252	µg/L	5.5	140	5.5	
Isopropylbenzene	98828	µg/L	800	NV	800	
1,1,2,2-Tetrachloroethane	79345	µg/L	0.22	4	0.22	
1,2,3-Trichloropropane	96184	µg/L	0.0063	NV	0.0063	
trans-1,4-Dichloro-2-butene	110576	µg/L	NV	NV	NV	

Table 3-4. Groundwater Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Drinking Water Screening Level[a]	Surface Water Protection Screening Level[b]	Final Groundwater Screening Level[c]	See Footnote
n-Propyl Benzene	103651	µg/L	NV	NV	NV	
Bromobenzene	108861	µg/L	NV	NV	NV	
1,3,5-Trimethylbenzene	108678	µg/L	400	NV	400	
2-Chlorotoluene	95498	µg/L	160	NV	160	
4-Chlorotoluene	106434	µg/L	NV	NV	NV	
t-Butylbenzene	98066	µg/L	NV	NV	NV	
1,2,4-Trimethylbenzene	95636	µg/L	400	NV	400	
s-Butylbenzene	135988	µg/L	NV	NV	NV	
4-Isopropyl Toluene	99876	µg/L	NV	NV	NV	
1,3-Dichlorobenzene	541731	µg/L	NV	960	960	
1,4-Dichlorobenzene	106467	µg/L	18	49	18	
n-Butylbenzene	104518	µg/L	NV	NV	NV	
1,2-Dichlorobenzene	95501	µg/L	600	1,300	600	
1,2-Dibromo-3-chloropropane	96128	µg/L	0.2	NV	0.2	
1,2,4-Trichlorobenzene	120821	µg/L	70	70	70	
Hexachlorobutadiene	87683	µg/L	0.56	18	0.56	
Naphthalene	91203	µg/L	160	765	160	
1,2,3-Trichlorobenzene	87616	µg/L	NV	NV	NV	
Dioxins/Furans						
2,3,7,8-TCDD	1746016	µg/L	5.8E-06	5.1E-09	5.1E-09	
2,3,7,8-TCDF	51207319	µg/L	NV	NV	NV	
1,2,3,7,8-PeCDD	40321764	µg/L	NV	NV	NV	
1,2,3,7,8-PeCDF	57117416	µg/L	NV	NV	NV	
2,3,4,7,8-PeCDF	57117314	µg/L	NV	NV	NV	
1,2,3,4,7,8-HxCDD	39227286	µg/L	NV	NV	NV	
1,2,3,6,7,8-HxCDD	57653857	µg/L	NV	NV	NV	
1,2,3,7,8,9-HxCDD	19408743	µg/L	NV	NV	NV	
1,2,3,4,7,8-HxCDF	70648269	µg/L	NV	NV	NV	
1,2,3,6,7,8-HxCDF	57117449	µg/L	NV	NV	NV	
1,2,3,7,8,9-HxCDF	72918219	µg/L	NV	NV	NV	
2,3,4,6,7,8-HxCDF	60851345	µg/L	NV	NV	NV	
1,2,3,4,6,7,8-HpCDD	35822469	µg/L	NV	NV	NV	
1,2,3,4,6,7,8-HpCDF	67562394	µg/L	NV	NV	NV	
1,2,3,4,7,8,9-HpCDF	70648258	µg/L	NV	NV	NV	
OCDD	3268879	µg/L	NV	NV	NV	
OCDF	39001020	µg/L	NV	NV	NV	
Total tetrachlorinated dioxins	41903575	µg/L	NV	NV	NV	
Total pentachlorinated dioxins	36088229	µg/L	NV	NV	NV	

Table 3-4. Groundwater Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Drinking Water Screening Level[a]	Surface Water Protection Screening Level[b]	Final Groundwater Screening Level[c]	See Footnote
Total hexachlorinated dioxins	34465468	µg/L	NV	NV	NV	
Total heptachlorinated dioxins	55684941	µg/L	NV	NV	NV	
Total tetrachlorinated furans	30402143	µg/L	NV	NV	NV	
Total pentachlorinated furans	30402154	µg/L	NV	NV	NV	
Total hexachlorinated furans	55684941	µg/L	NV	NV	NV	
Total heptachlorinated furans	38998753	µg/L	NV	NV	NV	

Notes:

[a] Method B cleanup levels were developed per WAC 173-340-720(4), with the exception of petroleum hydrocarbons, which are Method A values (WAC 173-340-900, Table 720-1).

[a] Method B cleanup levels were developed per WAC 173-340-730(3).

[c] The final groundwater screening level is the minimum of the drinking water and surface water screening levels.

[d] The final groundwater (drinking water) screening level was selected because benzene was not detected in groundwater samples.

[e] Drinking water screening levels for petroleum are Method A.

[f] Value not available; value shown is for gamma-BHC (lindane).

[g] Value not available; value shown is for chlordane.

[h] Value not available; value shown is for endosulfan.

CAS = Chemical Abstracts Service
NV = no value
QAPP = quality assurance project plan

Table 3-5. Soil Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Direct Contact Pathway Screening Level[a]	Simplifed TEE Screening Level[b]	Final Soil Screening Level[c]
Geotechnical Testing					
Grain size	--	percent	NV	NV	NV
Atterberg lmits	--	percent	NV	NV	NV
Specific gravity	--	g/cc	NV	NV	NV
Organic content	--	percent	NV	NV	NV
Moisture content	--	percent	NV	NV	NV
Metals					
Arsenic III (saturated soil)	7440382	mg/kg	7 [d]	20	7
Arsenic V (unstaurated soil)	7440382	mg/kg	7 [d]	260	7
Cadmium	7440439	mg/kg	80	36	36
Chromium	7440473	mg/kg	120,000 [e]	135	135
Chromium (VI)	18540299	mg/kg	240	NV	240
Copper	7440508	mg/kg	2,960	550	550
Lead	7439921	mg/kg	250	220	220
Mercury	7439976	mg/kg	24	9 [f]	9
Nickel	7440020	mg/kg	1,600 [g]	1,850	1,600
Tin	7440315	mg/kg	48,000	NV [h]	48,000
Zinc	7440666	mg/kg	24,000	570	570
Petroleum Hydrocarbons					
Gasoline-range hydrocarbons (toluene - naphthalene)	GRH	mg/kg	30/100 [i]	12,000 [j]	30
Diesel-range hydrocarbons (nC12-nC24) [g]	DRH	mg/kg	2,000	15,000 [j]	2,000
Oil-range hydrocarbons (nC24-nC38)	HORH	mg/kg	2,000	NV	2,000
VPH					
C5 – C6 Aliphatics	--	wt	NV	NV	NV
C6 – C8 Aliphatics	--	wt	NV	NV	NV
C8 – C10 Aliphatics	--	wt	NV	NV	NV
C10 – C12 Aliphatics	--	wt	NV	NV	NV
C8 – C10 Aromatics	--	wt	NV	NV	NV
C10 – C12 Aromatics	--	wt	NV	NV	NV
C12 – C13 Aromatics	--	wt	NV	NV	NV
EPH					
C8 – C10 Aliphatics	C	wt	NV	NV	NV
C10 – C12 Aliphatics	D	wt	NV	NV	NV
C12 – C16 Aliphatics	E	wt	NV	NV	NV
C16 – C21 Aliphatics	F	wt	NV	NV	NV
C21 – C34 Aliphatics	G	wt	NV	NV	NV
C8 – C10 Aromatics	H	wt	NV	NV	NV
C10 – C12 Aromatics	I	wt	NV	NV	NV
C12 – C16 Aromatics	K	wt	NV	NV	NV

Table 3-5. Soil Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Direct Contact Pathway Screening Level[a]		Simplifed TEE Screening Level[b]		Final Soil Screening Level[c]
C16 – C21 Aromatics	L	wt	NV		NV		NV
C21 – C34 Aromatics	M	wt	NV		NV		NV
Organochlorine Pesticides							
4,4’-DDD	72548	mg/kg	4.2		NV		4.2
4,4’-DDE	72559	mg/kg	2.9		NV		2.9
4,4’-DDT	50293	mg/kg	2.9		NV		2.9
DDD/DDE/DDT (total)	NA	mg/kg	NV		1		1
Aldrin	309002	mg/kg	0.059		0.17		0.059
alpha-BHC	319846	mg/kg	0.16		10	k	0.16
beta-BHC	319857	mg/kg	0.56		10	k	0.56
delta-BHC	319868	mg/kg	NV		10	k	10
gamma-BHC (Lindane)	58899	mg/kg	24		10	k	10
alpha-Chlordane	5103719	mg/kg	2.9	l	7	l	2.9
gamma-Chlordane	5566347	mg/kg	2.9	l	7	l	2.9
trans-Chlordane	5103742	mg/kg	2.9	l	7	l	2.9
Dieldrin	60571	mg/kg	0.063		0.17		0.063
Endosulfan I	959988	mg/kg	480	m	NV	h	480
Endosulfan II	33213659	mg/kg	480	m	NV	h	480
Endosulfan sulfate	1031078	mg/kg	480	m	NV		NV
Endrin	72208	mg/kg	24		0.4		0.4
Endrin aldehyde	7421934	mg/kg	NV		NV		NV
Endrin ketone	53494705	mg/kg	NV		NV		NV
Heptachlor	76448	mg/kg	0.22		NV		0.22
Heptachlor epoxide	1024573	mg/kg	0.11		NV		0.11
Heptachlor/Heptachlor epoxide (total)	NA	mg/kg	NV		0.6		0.6
Hexachlorobenzene	118741	mg/kg	0.63		31		0.63
Hexachlorobutadiene	87683	mg/kg	13		NV		13
Methoxychlor	72435	mg/kg	400		NV		400
Toxaphene	8001352	mg/kg	0.91		NV	h	0.91
PCB Aroclors							
Aroclor 1016	12674112	mg/kg	5.6		NV		5.6
Aroclor 1221	11104282	mg/kg	NV		NV		NV
Aroclor 1232	11141165	mg/kg	NV		NV		NV
Aroclor 1242	53469219	mg/kg	NV		NV		NV
Aroclor 1248	12672296	mg/kg	NV		NV		NV
Aroclor 1254	11097691	mg/kg	1.6		NV		1.6
Aroclor 1260	11096825	mg/kg	NV		NV		NV
Aroclor 1262	37324235	mg/kg	NV		NV		NV
Aroclor 1268	11100144	mg/kg	NV		NV		NV

Table 3-5. Soil Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Direct Contact Pathway Screening Level[a]	Simplifed TEE Screening Level[b]	Final Soil Screening Level[c]
PCBs (total)	1336363	mg/kg	1 [n]	2	1
Semivolatile Organic Compounds					
1,2,4-Trichlorobenzene	120821	mg/kg	800	NV	800
1,2-Dichlorobenzene	95501	mg/kg	7,200	NV	7,200
1,3-Dichlorobenzene	541731	mg/kg	NV	NV	NV
1,4-Dichlorobenzene	106467	mg/kg	42	NV	42
1-Methylnaphthalene	90120	mg/kg	NV	NV	NV
2,2'-Oxybis(1-chloropropane)	108601	mg/kg	14	NV	14
2,4,5-Trichlorophenol	95954	mg/kg	8,000	NV	8,000
2,4,6-Trichlorophenol	88062	mg/kg	91	NV	91
2,4-Dichlorophenol	120832	mg/kg	240	NV	240
2,4-Dimethylphenol	105679	mg/kg	1,600	NV	1,600
2,4-Dinitrophenol	51285	mg/kg	160	NV	160
2,4-Dinitrotoluene	121142	mg/kg	160	NV	160
2,6-Dinitrotoluene	606202	mg/kg	80	NV	80
2-Chloronaphthalene	91587	mg/kg	6400	NV	6,400
2-Chlorophenol	95578	mg/kg	400	NV	400
2-Methylnaphthalene	91576	mg/kg	320	NV	320
2-Methylphenol	95487	mg/kg	4,000	NV	4,000
2-Nitroaniline	88744	mg/kg	NV	NV	NV
2-Nitrophenol	88755	mg/kg	NV	NV	NV
3,3'-Dichlorobenzidine	91941	mg/kg	2.2	NV	2.2
3-Nitroaniline	99092	mg/kg	NV	NV	NV
4,6-Dinitro-2-methylphenol	534521	mg/kg	NV	NV	NV
4-Bromophenyl-phenyl ether	101553	mg/kg	NV	NV	NV
4-Chloro-3-methylphenol	59507	mg/kg	NV	NV	NV
4-Chloroaniline	106478	mg/kg	320	NV	320
4-Chlorophenyl-phenyl ether	7005723	mg/kg	NV	NV	NV
4-Methylphenol	106445	mg/kg	400	NV	400
4-Nitroaniline	100016	mg/kg	NV	NV	NV
4-Nitrophenol	100027	mg/kg	NV	NV	NV
Acenaphthene	83329	mg/kg	4,800	NV [h]	4,800
Acenaphthylene	208968	mg/kg	NV	NV	NV
Anthracene	120127	mg/kg	24,000	NV	24,000
Benzo(a)anthracene	56553	mg/kg	NV	NV	NV
Benzo(a)pyrene	50328	mg/kg	0.14	300	0.14
Benzo(a)pyrene TEQ	NA	mg/kg	0.14	NV	0.14
Benzo(b)fluoranthene	205992	mg/kg	NV	NV	NV
Benzo(g,h,i)perylene	191242	mg/kg	NV	NV	NV

Table 3-5. Soil Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Direct Contact Pathway Screening Level[a]	Simplifed TEE Screening Level[b]	Final Soil Screening Level[c]
Benzo(k)fluoranthene	207089	mg/kg	NV	NV	NV
Benzoic Acid	65850	mg/kg	320,000	NV	320,000
Benzyl Alcohol	100516	mg/kg	24,000	NV	24,000
Bis-(2-chloroethoxy) methane	111911	mg/kg	NV	NV	NV
Bis-(2-chloroethyl) ether	111444	mg/kg	0.91	NV	0.91
bis(2-Ethylhexyl) phthalate	117817	mg/kg	71	NV [h]	71
Butylbenzylphthalate	85687	mg/kg	16,000	NV	16,000
Carbazole	86748	mg/kg	50	NV	50
Chrysene	218019	mg/kg	NV	NV	NV
Dibenzo(a,h)anthracene	53703	mg/kg	NV	NV	NV
Dibenzofuran	132649	mg/kg	160	NV	160
Diethylphthlalate	84662	mg/kg	64,000	NV	64,000
Dimethylphthalate	131113	mg/kg	80,000	NV	80,000
Di-n-butylphthalate	84742	mg/kg	8,000	NV [h]	8,000
Di-n-octylphthalate	117840	mg/kg	1,600	NV	1,600
Fluoranthene	206440	mg/kg	3,200	NV	3,200
Fluorene	86737	mg/kg	3,200	NV	3,200
Hexachlorobenzene	118741	mg/kg	0.63	31	0.63
Hexachlorobutadiene	87683	mg/kg	13	NV	13
Hexachlorocyclopentadiene	77474	mg/kg	480	NV	480
Hexachloroethane	67721	mg/kg	71	NV	71
Indeno(1,2,3-cd)pyrene	193395	mg/kg	NV	NV	NV
Isophorone	78591	mg/kg	1,053	NV	1,053
Naphthalene	91203	mg/kg	1,600	NV	1,600
Nitrobenzene	98953	mg/kg	40	NV	40
N-Nitroso-di-n-propylamine	621647	mg/kg	0.14	NV	0.14
N-Nitrosodiphenylamine	86306	mg/kg	204	NV	204
Pentachlorophenol	87865	mg/kg	8.3	11	8.3
Phenanthrene	85018	mg/kg	NV	NV	NV
Phenol	108952	mg/kg	48,000	NV	48,000
Pyrene	129000	mg/kg	2,400	NV	2,400
Polycyclic Aromatic Hydrocarbons					
1-Methylnaphthalene	90120	mg/kg	NV	NV	NV
2-Methylnaphthalene	91576	mg/kg	320	NV	320
Acenaphthene	83329	mg/kg	4,800	NV [h]	4,800
Acenaphthylene	208968	mg/kg	NV	NV	NV
Anthracene	120127	mg/kg	24,000	NV	24,000
Benzo(a)anthracene	56553	mg/kg	NV	NV	NV
Benzo(a)pyrene	50328	mg/kg	0.14	300	0.14

Table 3-5. Soil Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Direct Contact Pathway Screening Level[a]	Simplifed TEE Screening Level[b]	Final Soil Screening Level[c]
Benzo(a)pyrene TEQ	NA	mg/kg	0.14	NV	0.14
Benzo(b)fluoranthene	205992	mg/kg	NV	NV	NV
Benzo(g,h,i)perylene	191242	mg/kg	NV	NV	NV
Benzo(k)fluoranthene	207089	mg/kg	NV	NV	NV
Chrysene	218019	mg/kg	NV	NV	NV
Dibenzo(a,h)anthracene	53703	mg/kg	NV	NV	NV
Dibenzofuran	132649	mg/kg	160	NV	160
Fluoranthene	206440	mg/kg	3,200	NV	3,200
Fluorene	86737	mg/kg	3,200	NV	3,200
Indeno(1,2,3-cd)pyrene	193395	mg/kg	NV	NV	NV
Naphthalene	91203	mg/kg	1,600	NV	1,600
Phenanthrene	85018	mg/kg	NV	NV	NV
Pyrene	129000	mg/kg	2,400	NV	2,400
Skydrol™ Components					
Tributyl phosphate	126738	mg/kg	109	NV	109
Dibutyl phenyl phosphate	2528361	mg/kg	NV	NV	NV
Butyl diphenyl phosphate	2752956	mg/kg	NV	NV	NV
Triphenyl phosphate	115866	mg/kg	NV	NV	NV
Volatile Organic Compounds					
1,1,1,2-Tetrachloroethane	630206	mg/kg	38	NV	38
1,1,1-Trichloroethane	71556	mg/kg	160,000	NV	160,000
1,1,2,2-Tetrachloroethane	79345	mg/kg	5	NV	5
1,1,2-Trichloroethane	79005	mg/kg	18	NV	18
1,1-Dichloroethane	75343	mg/kg	16,000	NV	16,000
1,1-Dichloroethene	75354	mg/kg	4,000	NV	4,000
1,1-Dichloropropene	563586	mg/kg	NV	NV	NV
1,2,3-Trichlorobenzene	87616	mg/kg	NV	NV	NV
1,2,3-Trichloropropane	96184	mg/kg	0.14	NV	0.14
1,2,4-Trichlorobenzene	120821	mg/kg	800	NV	800
1,2,4-Trimethylbenzene	95636	mg/kg	4,000	NV	4,000
1,2-Dibromo-3-chloropropane	96128	mg/kg	0.71	NV	0.71
1,2-Dibromoethane	106934	mg/kg	0.5	NV	0.5
1,2-Dichlorobenzene	95501	mg/kg	7,200	NV	7,200
1,2-Dichloroethane	107062	mg/lg	11	NV	11
1,2-Dichloropropane	78875	mg/kg	15	NV	15
1,3,5-Trimethylbenzene	108678	mg/kg	4,000	NV	4,000
1,3-Dichlorobenzene	541731	mg/kg	NV	NV	NV
1,3-Dichloropropane	142289	mg/kg	NV	NV	NV
1,4-Dichlorobenzene	106467	mg/kg	42	NV	42

Table 3-5. Soil Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Direct Contact Pathway Screening Level[a]	Simplifed TEE Screening Level[b]	Final Soil Screening Level[c]
2,2-Dichloropropane	594207	mg/kg	NV	NV	NV
2-Butanone	78933	mg/kg	48,000	NV	48,000
2-Chloroethyl Vinyl Ether	110758	mg/kg	NV	NV	NV
2-Chlorotoluene	95498	mg/kg	1,600	NV	1,600
2-Hexanone	591786	mg/kg	NV	NV	NV
4-Chlorotoluene	106434	mg/kg	NV	NV	NV
4-Isopropyl Toluene	99876	mg/kg	NV	NV	NV
4-Methyl-2-pentanone	108101	mg/kg	6,400	NV	6,400
Acetone	67641	mg/kg	8,000	NV	8,000
Acrolein	107028	mg/kg	1,600	NV	1,600
Acrylonitrile	107131	mg/kg	1.9	NV	1.9
Benzene	71432	mg/kg	18	NV	18
Bromobenzene	108861	mg/kg	NV	NV	NV
Bromochloromethane	74975	mg/kg	NV	NV	NV
Bromodichloromethane	75274	mg/kg	16	NV	16
Bromoethane	74964	mg/kg	NV	NV	NV
Bromoform	75252	mg/kg	127	NV	127
Bromomethane	74839	mg/kg	112	NV	112
Carbon Disulfide	75150	mg/kg	8,000	NV	8,000
Carbon Tetrachloride	56235	mg/kg	7.7	NV	7.7
Chlorobenzene	108907	mg/kg	1600	NV	1600
Chlorodibromomethane	124481	mg/kg	12	NV	12
Chloroethane	75003	mg/kg	350	NV	350
Chloroform	67663	mg/kg	164	NV	164
Chloromethane	74873	mg/kg	77	NV	77
cis-1,2-Dichloroethene	156592	mg/kg	800	NV	800
cis-1,3-Dichloropropene	10061015	mg/kg	NV	NV	NV
Dibromomethane	74953	mg/kg	800	NV	800
Dichlorodifluoromethane	75718	mg/kg	160,000	NV	160,000
Ethylbenzene	100414	mg/kg	8,000	NV	8,000
Hexachlorobutadiene	87683	mg/kg	13	NV	13
Iodomethane	74884	mg/kg	NV	NV	NV
Isopropylbenzene	98828	mg/kg	8,000	NV	8,000
m,p-Xylene	179601231	mg/kg	160,000 o	NV	160,000
Methylene Chloride	75092	mg/kg	133	NV	133
Methyl-t-butyl ether (MTBE)	1634044	mg/kg	556	NV	556
Naphthalene	91203	mg/kg	1,600	NV	1,600
n-Butylbenzene	104518	mg/kg	NV	NV	NV
n-Propyl Benzene	103651	mg/kg	NV	NV	NV

Table 3-5. Soil Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Direct Contact Pathway Screening Level[a]	Simplifed TEE Screening Level[b]	Final Soil Screening Level[c]
o-Xylene	95476	mg/kg	160,000	NV	160,000
s-Butylbenzene	135988	mg/kg	NV	NV	NV
Styrene	100425	mg/kg	33	NV	33
t-Butylbenzene	98066	mg/kg	NV	NV	NV
Tetrachloroethene	127184	mg/kg	1.9	NV	1.9
Toluene	108883	mg/kg	6,400	NV	6,400
Total xylenes	1330207	mg/kg	1,600	NV	1,600
trans-1,2-Dichloroethene	156605	mg/kg	1,600	NV	1,600
trans-1,3-Dichloropropene	10061026	mg/kg	NV	NV	NV
trans-1,4-Dichloro-2-butene	110576	mg/kg	NV	NV	NV
Trichloroethene	79016	mg/kg	11	NV	11
Trichlorofluoromethane	75694	mg/kg	24,000	NV	24,000
Trifluoroethane	76131	mg/kg	2,400,000	NV	2,400,000
Vinyl acetate	108054	mg/kg	80,000	NV	80,000
Vinyl chloride	75014	mg/kg	0.67	NV	0.67
Dioxins/Furans					
2,3,7,8-TCDD	1746016	mg/kg	1.1E-05	NV	1.1E-05
2,3,7,8-TCDF	51207319	mg/kg	NV	NV	NV
1,2,3,7,8-PeCDD	40321764	mg/kg	NV	NV	NV
1,2,3,7,8-PeCDF	57117416	mg/kg	NV	NV	NV
2,3,4,7,8-PeCDF	57117314	mg/kg	NV	NV	NV
1,2,3,4,7,8-HxCDD	39227286	mg/kg	NV	NV	NV
1,2,3,6,7,8-HxCDD	57653857	mg/kg	NV	NV	NV
1,2,3,7,8,9-HxCDD	19408743	mg/kg	NV	NV	NV
1,2,3,4,7,8-HxCDF	70648269	mg/kg	NV	NV	NV
1,2,3,6,7,8-HxCDF	57117449	mg/kg	NV	NV	NV
1,2,3,7,8,9-HxCDF	72918219	mg/kg	NV	NV	NV
2,3,4,6,7,8-HxCDF	60851345	mg/kg	NV	NV	NV
1,2,3,4,6,7,8-HpCDD	35822469	mg/kg	NV	NV	NV
1,2,3,4,6,7,8-HpCDF	67562394	mg/kg	NV	NV	NV
1,2,3,4,7,8,9-HpCDF	70648258	mg/kg	NV	NV	NV
OCDD	3268879	mg/kg	NV	NV	NV
OCDF	39001020	mg/kg	NV	NV	NV
Total tetrachlorinated dioxins	41903575	mg/kg	NV	NV	NV
Total pentachlorinated dioxins	36088229	mg/kg	NV	NV	NV
Total hexachlorinated dioxins	34465468	mg/kg	NV	NV	NV
Total heptachlorinated dioxins	55684941	mg/kg	NV	NV	NV
Total tetrachlorinated furans	30402143	mg/kg	NV	NV	NV
Total pentachlorinated furans	30402154	mg/kg	NV	NV	NV

Table 3-5. Soil Screening Levels

List of Analytes for Each Method Based on QAPP	CAS Number	Screening Level Units	Direct Contact Pathway Screening Level[a]	Simplifed TEE Screening Level[b]	Final Soil Screening Level[c]
Total hexachlorinated furans	55684941	mg/kg	NV	NV	NV
Total heptachlorinated furans	38998753	mg/kg	NV	NV	NV
Total chlorinated dibenzofurans	NA	mg/kg	NV	3.E-06	3.0E-06
Total chlorinated dibenzo-p-dioxins	NA	mg/kg	NV	5.E-06	5.0E-06

Notes:

[a] Method B cleanup levels were developed per WAC 173-340-740, Equations 740-1 and 740-2, with the exception of petroleum hydrocarbons and lead, which are Method A values for unrestricted land use (WAC 173-340-900, Table 740-1). Cleanup levels were obtained from Ecology's Cleanup Levels and Risk Calculation (CLARC) database (Ecology 2010).

[b] Cleanup levels were obtained from WAC 173-340-900, Table 749-2, for industrial or commercial sites.

[c] The final soil screening level is the minimum of the direct contact pathway, simplified TEE, and leaching pathway screening levels, as described in the text.

[d] Value shown is the natural background value for Puget Sound (Ecology 1994).

[e] Value not available; value shown is for chromium (III).

[f] Value shown is for inorganic mercury; mercury present in soil is assumed to be inorganic.

[g] Value for total nickel not available; value shown is for soluble nickel salts.

[h] Per WAC 173-340-900, Table 749-2, a safe concentration has not yet been established.

[i] A direct contact pathway screening level value of 100 mg/kg is used in areas where benzene is not detected in soil and the total of toluene, ethylbenzene, and xylenes is less than 1 percent of the gasoline mixture. A level of 30 mg/kg is used in areas that do not qualify for the 100 mg/kg cleanup level.

[j] Except that the concentration shall not exceed residual saturation at the soil surface.

[k] Value not available; value shown is for benzene hexachloride (including lindane).

[l] Value not available; value shown is for chlordane.

[m] Value not available; value shown is for endosulfan.

[n] Based on TSCA, as discussed in the text.

[o] Value not available for o-xylene; value shown is for m-xylene.

CAS = Chemical Abstracts Service
NA = not applicable
NF = chemical not found in database
NV = no value
TEE = terrestrial ecological evaluation